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PROF. H. L.



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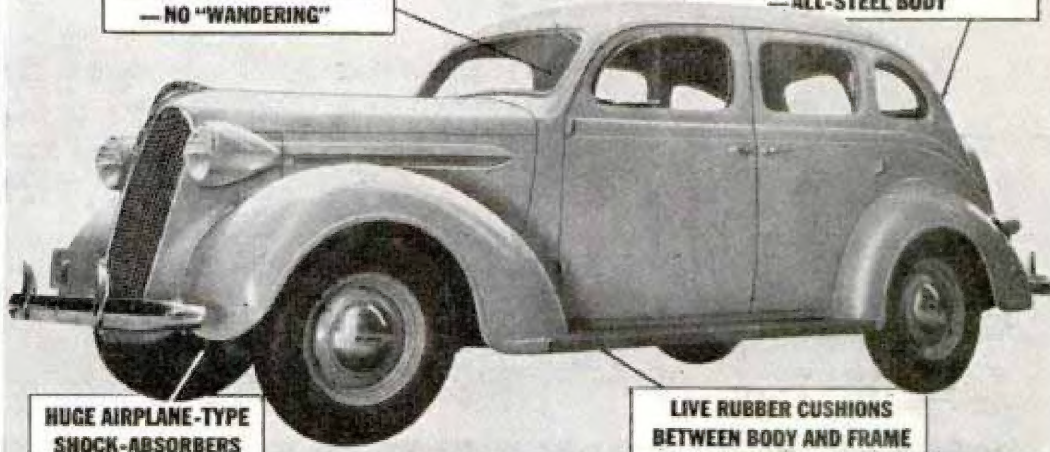


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This One



A Happy New Year for

Kathryn

Dear Warner: You can toss away the memorandum of that other phone number now as we have one of our own! And if you don't think I feel swell about it, you're not the smart brother I think you are. I get a kick every time I pass that telephone in the living room.

Kathryn

The number is Exchange 2376.



THAT'S a real letter—written by a real Kathryn—to her brother. You can read her happiness in every line. She's mighty glad to have the telephone back.

And so are a great many other men and women these days. About 850,000 new telephones have been installed in the past year.

That means more than just having a telephone within reach. It means keeping the family circle unbroken—contacts with people—gaiety, solace, friendship. It means greater comfort, security; quick aid in an emergency.

There's a lot more happiness for everybody when there's a telephone in the home.

BELL TELEPHONE SYSTEM

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Popular Mechanics Magazine

H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

February, 1937

Vol. 67, No. 2

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Sawdust Solves Crimes

A WISCONSIN woman opened a Christmas package addressed to her husband and was killed when the parcel, containing a crude bomb, exploded as she removed the wrapper. A few remnants of the bomb, including some wood debris, were the only clues. There was a suspect but no evidence—until a wood detective unearthed minute scraps of shavings and grains of sawdust from behind the leg of a workbench in the suspect's shop and, under the microscope, matched particles of the sawdust with bits of wood from the bomb. That evidence sent the suspect to prison for life. This is just one of many cases in which the wood sleuth, by the microscopic examination and identification of wood species, solves seemingly baffling mysteries involving not only crimes but many other forms of litigation. Watch for the article describing the work of this modern Sherlock Holmes in the March issue.

Next Month

ILLUSTRATED with eight pages of Coloroto pictures, the second part of "Around the World by Air," in the March issue, describes the journey over the Pacific in one of the "China Clippers" and the trip across this continent in a modern sleeper plane, both impossible feats only a few short months ago.

Wings to the Rescue

OVER land and over sea, wherever men fly the commercial air lanes today, they have written a new chapter in the traditional rescue code of the sea." Thus does Dr. Hugo Eckener, veteran commander of the dirigible, "Hindenburg," pay tribute to the skippers of the air lines who almost daily risk their own lives to speed aid to the stricken and helpless. Their heroic feats form the basis for the true adventure story, "Air Liners to the Rescue," in the March issue.

Let's Go Fishin'

NOW that there are a couple of feet of ice on the lake, and every stream is frozen solid—let's go fishin'. There's no need to wait until spring to get out rod and reel. The fish are ready to bite in mid-winter. First, you chop a hole in the ice. With what? Bob Becker tells you just how to go about it next month in "Fishing Through the Ice."

ON THE ODDEST RACE COURSE IN THE WORLD

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place. Pyroil
played its
part great in
this 300 mile
road race."

(Signed)
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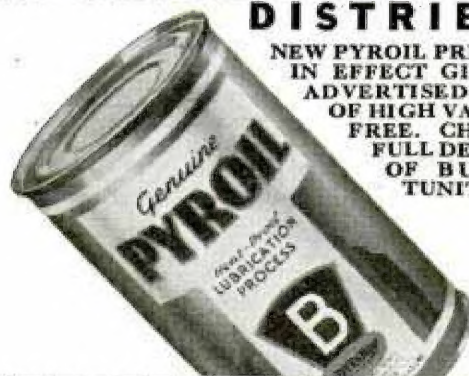
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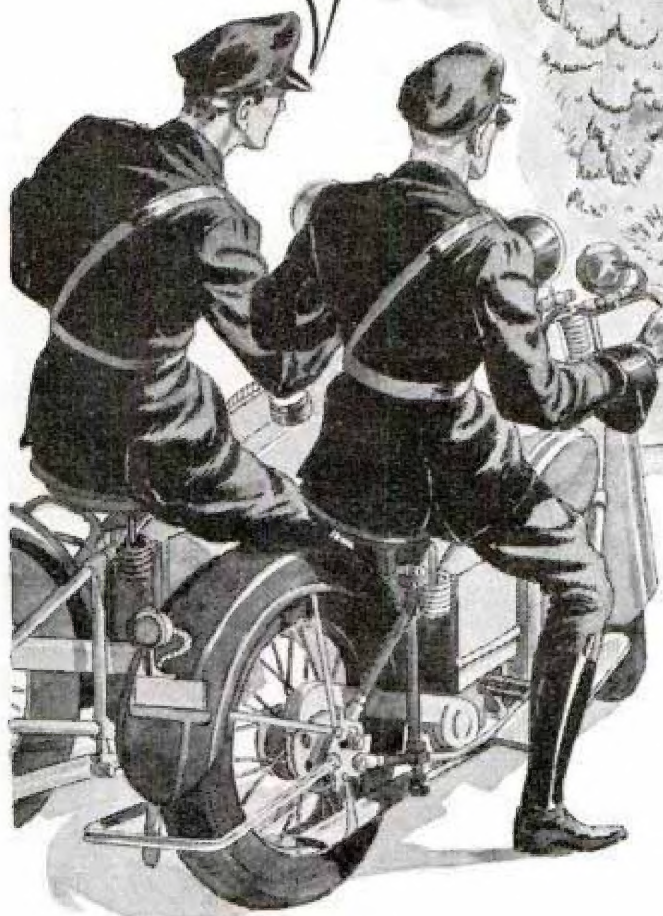
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1935
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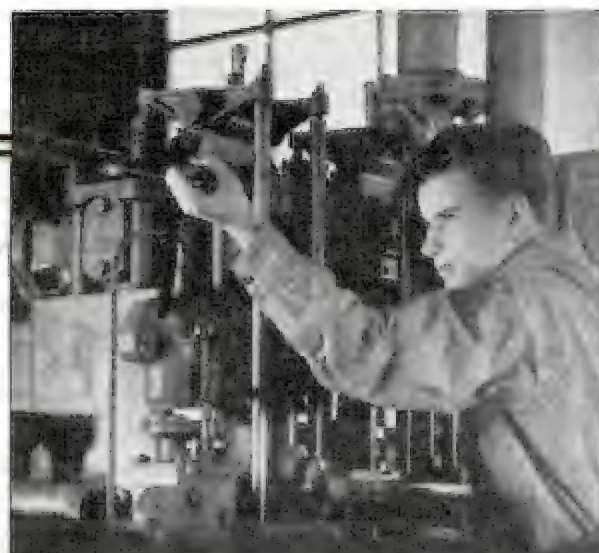
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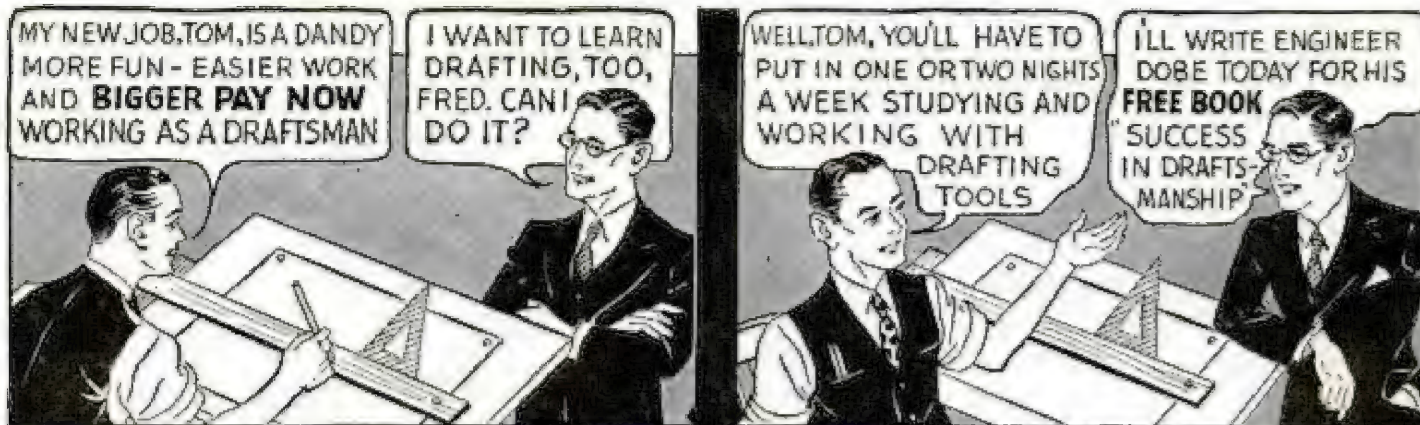
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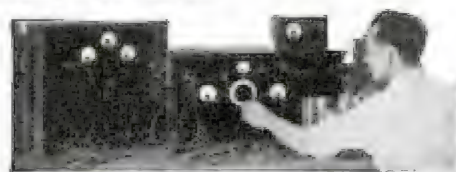
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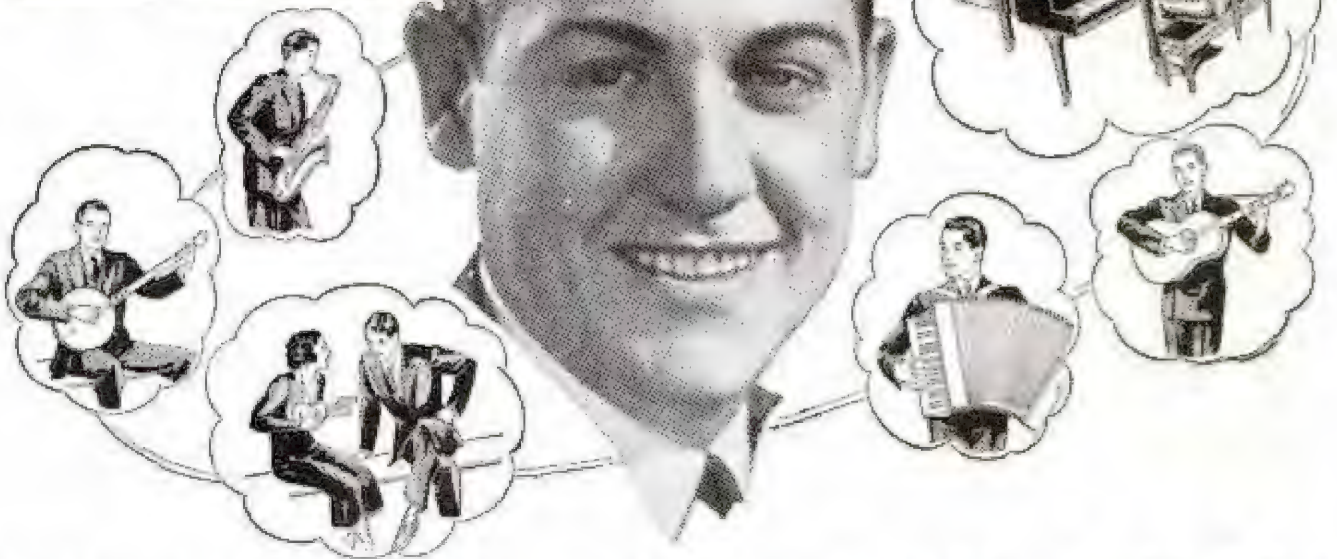
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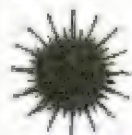
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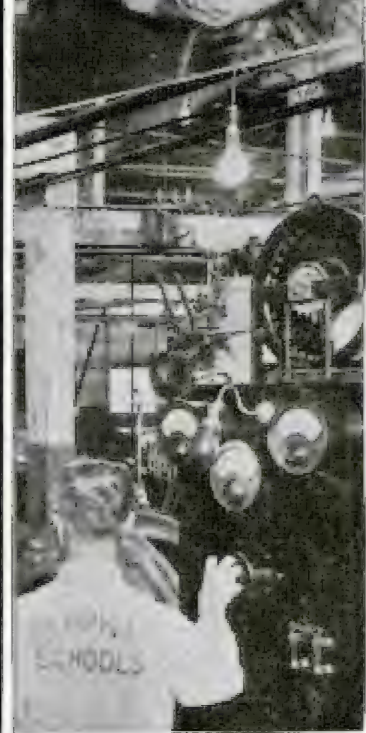
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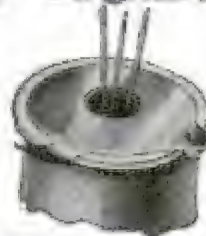
INVENTORS'

FOR THE YEAR



Here's the famous new electric organ, patented by John Hays Hammond, Jr.

Contains no pipes. Creates musical tones electrically. Connects to ordinary light socket. Smaller and lighter than an upright piano. Said to produce more than two hundred and fifty million different musical effects.



This combination thread-cutter and needle-holder

or, recently patented, may prove a boon to busy housewives, and it clearly shows what a field there is for handy household inventions. With this device, the needles are always right where you want them, and the thread is easily cut off without tangling or raveling.



Trailer construction has boomed. Predictions are that soon millions will be living and travelling in trailers. Inset shows a special type of trailer brake mechanism. (Manufactured by Wood-Down Trailer Co.) When driver of automobile trailer brakes, brakes are automatically applied to trailer.



Numerous inventions relating to the home, simple gadgets for

everyday use, are constantly being improved. Even such a commonplace article as the can opener affords room for improvement in construction. Shown is one patented this past year by Melvin Higgs, Pomona, California.



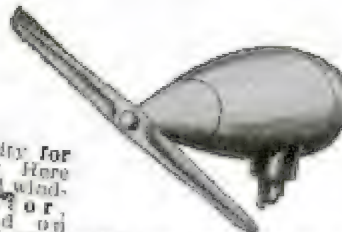
Many ad- vances have been made in fire construction. Shown is a new Life Guard Tube introduced by Gaudy, Inc. Has a secondary tube within the main tube. Many other developments in fire construction have taken place.



Great strides made in television with several practical sets for home reception demonstrated in New York and elsewhere.



Advancement has been made in the field of first aid and medical equipment. Here is a simple operating tourniquet which can be instantly applied to stop the flow of blood from an injured member of the body. Permits application of pressure and may be released instantly or gradually.



Electricity for the farm: Here is a novel wind-generator, or, patented on October 27, 1935, which may have the effect of bringing cheap electric power to thousands of isolated farms and homes. It feeds into the wind automatically and has an automatic governor.



Numerous patents have been taken out in Air Conditioning. It is predicted that homes, office and factory buildings and all forms of travel conveyances will be air conditioned.

FROM 1898



TO 1937



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1937 will be a good year for worth while inventions. Look Around—Look Ahead At the recent Centennial Celebration of the American Patent System an old letter of Andrew Carnegie's was reproduced, in which he spoke of his 1905 Winton Automobile. Mr. Carnegie said: "There may be improvements yet to come, but it is difficult to see room for them." Think of it! Difficult to see any room for improvement on a 1905 "chuggamobile." The truth is the 1937 automobile contains more than 100,000 patented improvements. There is always room for improvement. Men who look around, then look ahead can help the world and help

themselves by developing worthwhile inventions.

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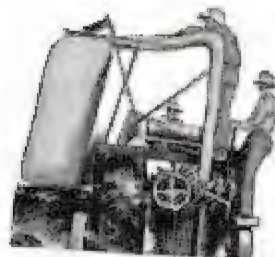
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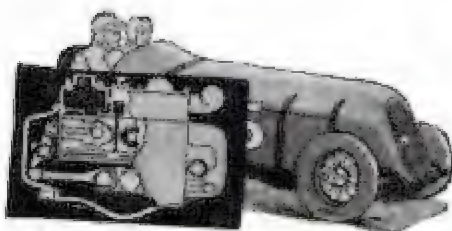
What will the inventions of 1937 be?

O F 1936

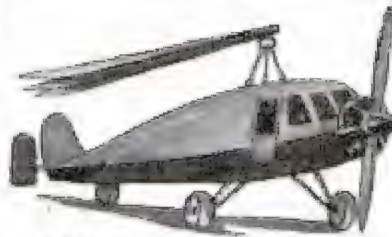


A startling inventive development brought to light this year is the famous Rust Cotton Picker said to do the work of seventy-five to one-

hundred men at one-sixth the cost. Will this prove as revolutionary in the cotton industry as Eli Whitney's famous cotton gin? Some say it will.



Diesel motors have commanded widespread attention. Shown is a racing car powered by Diesel. The car did 137.193 miles per hour. Inset shows a new Hill Diesel engine exhibited last year at New York Motor Boat Show. Its designer was R. E. Olds, pioneer in the automobile industry.



Aviation is, of course, a fertile field for inventive ingenuity. Important steps have been made to bring about the plane which average Mr. American man and woman can fly. Shown is an improved type of autogyro designed to land in any convenient spot. Then wingsfold back and the plane serves as an automobile. Just one of the many unusual aeronautical developments during the past year.



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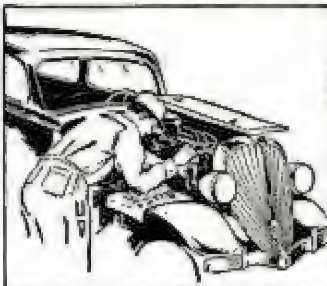
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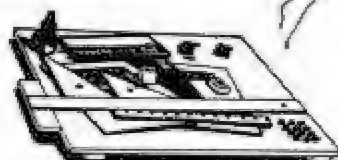
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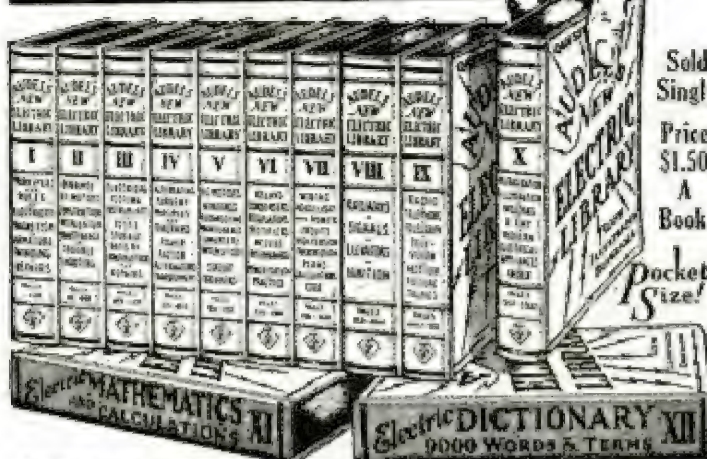
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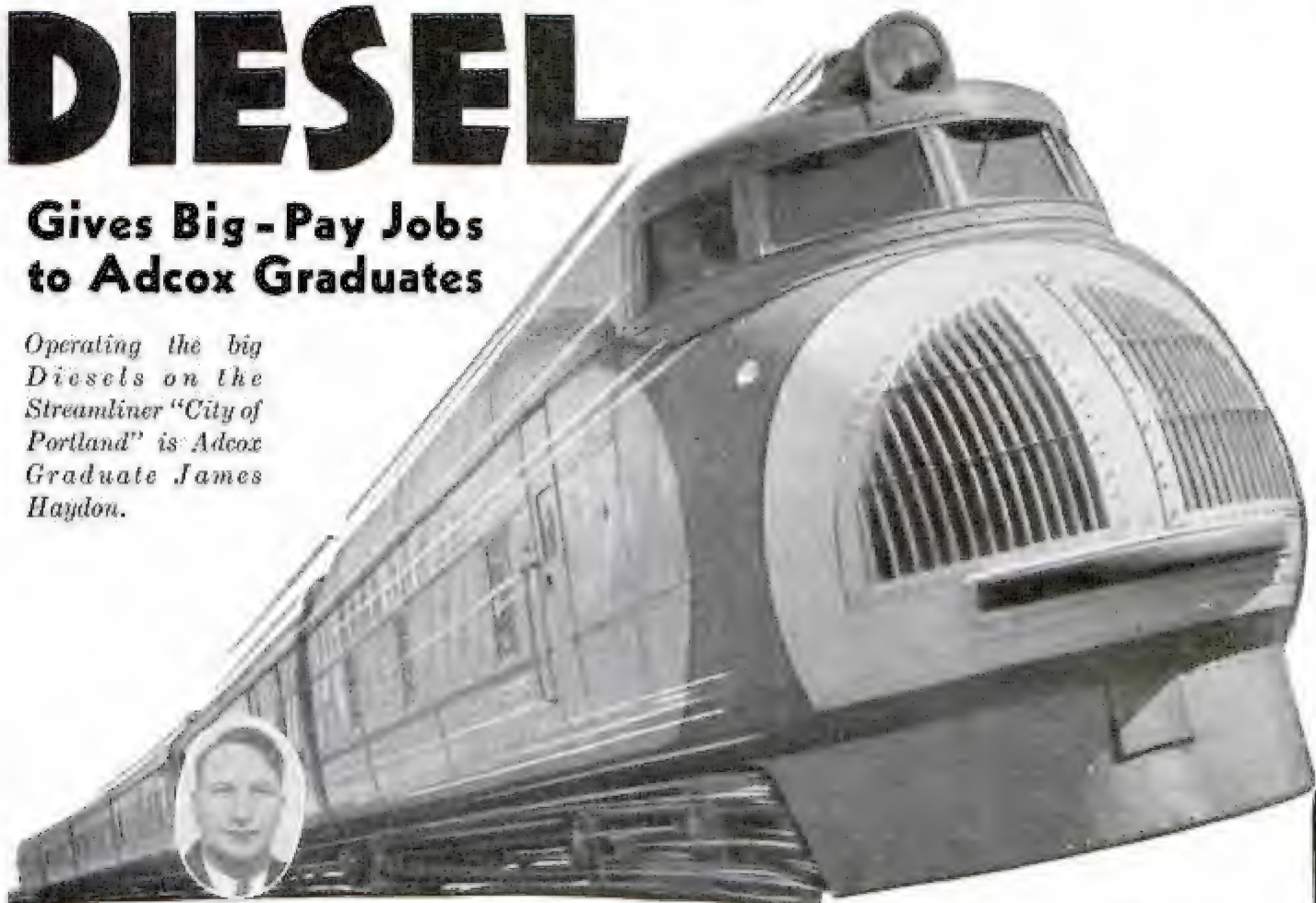
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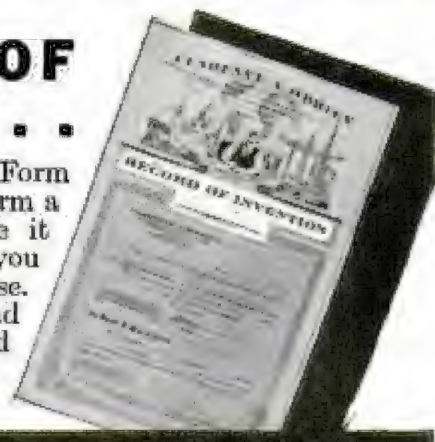
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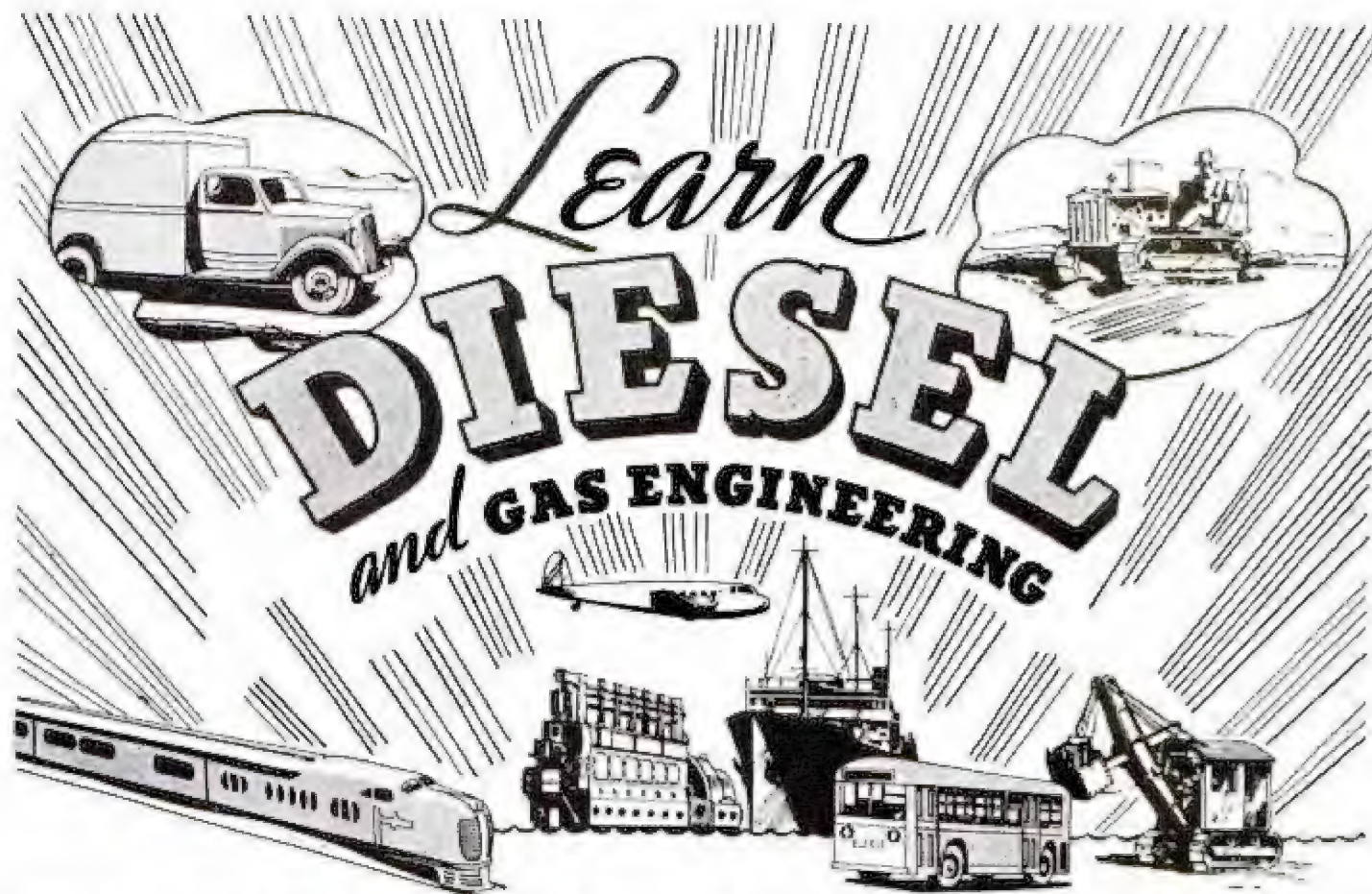
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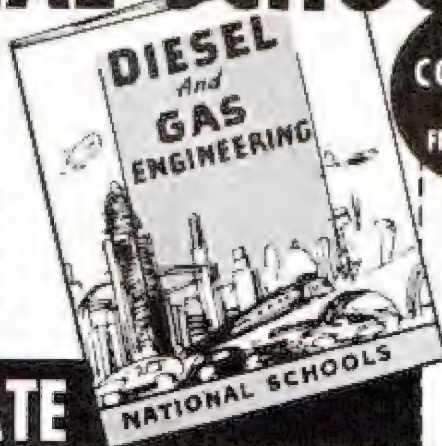


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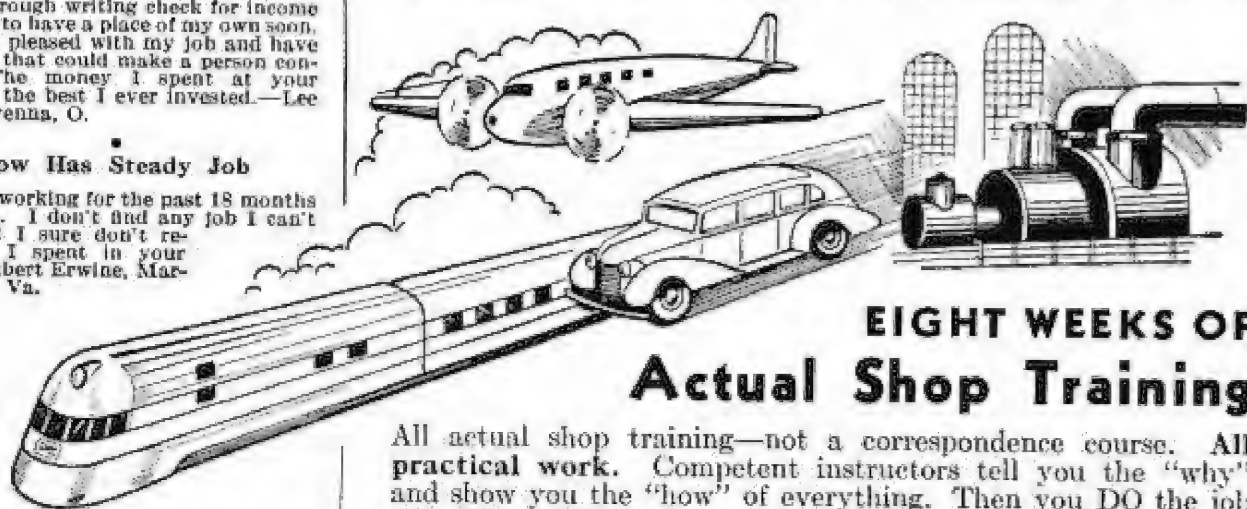
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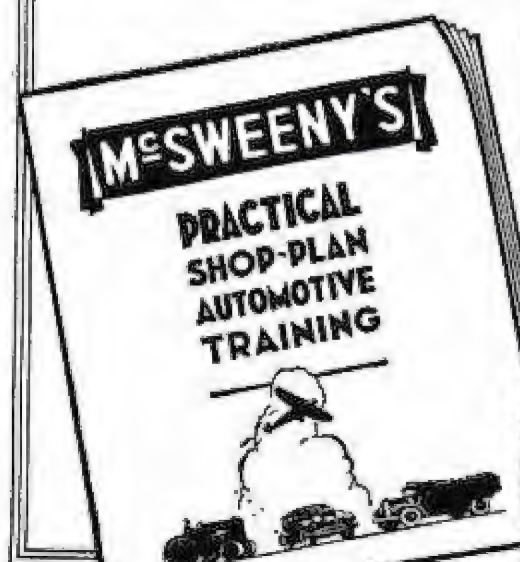
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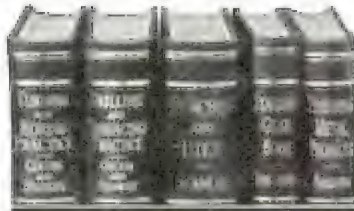
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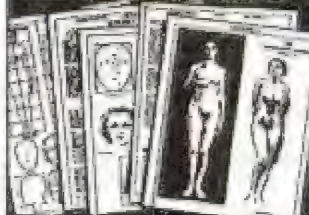


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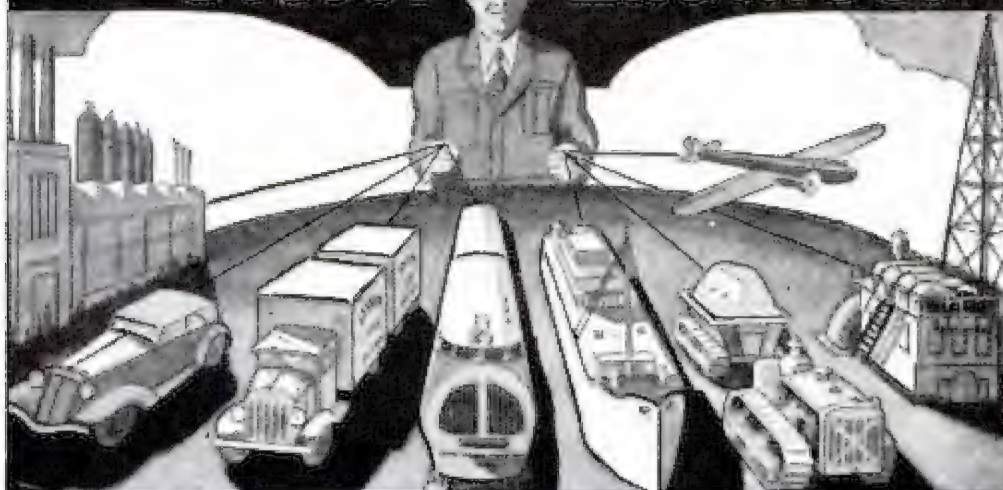
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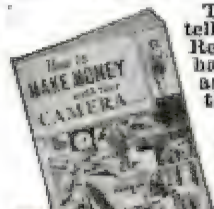
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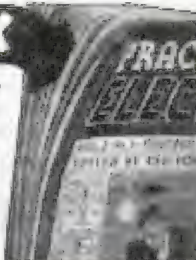
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STAMPS



..... and Collecting

F 15819

By Richard McP. Cabeen
Rt. 400, 333 N. Michigan, Chicago

THE beginner at stamp collecting will find stamps in a large packet which he cannot classify. Some do not give the country of origin, others give it in the strange characters of oriental lands. To sort such stamps, consult a standard catalog or an experienced collector.

Many types of stamps will be memorized for no collector has time to learn what the characters and inscriptions really mean.



Australian stamp issued to celebrate establishment of submarine telephone service between Tasmania and Australia

Flags and coats of arms often assist in determining the country which issued stamps, and the currency unit sometimes gives a clue. With all the stamps sorted according to countries, you begin to arrange your stamps in sets by placing all of a single design together.

Colors usually differ for the various values. Some countries cannot be sorted in this manner for there are no standard designs or sizes and all denominations differ in color, size and in the picture itself. The standard catalog shows pictures of all of the types and designs issued by foreign countries. Even though you arrange a very presentable sorted collection, you need a catalog to separate the different issues of a country.

Many nations have used a single design

many years, perhaps changing the entire series of colors one or more times, but more often changing the paper upon which the stamps are printed or the size and spacing of perforations. The catalog lists such changes. Variations in the gauge of perforations may be neglected by beginners when more than one gauge was in use at the same time. A change in paper may be due to several causes. There may be danger of counterfeiting, or it may be necessary to distinguish new stamps from those which have been counterfeited. The quality of paper may be altered, due to a change in printing, or it may be desired to improve the paper in some cases and cheapen it in others, or it may be impossible to obtain a further supply of certain kinds of paper. Important changes in paper usually are listed in the catalog as a complete new issue.

The stamp papers most important to the beginner are those known as wove paper, laid paper and granite paper. Nearly all commercial paper is of the first variety, including newspapers and magazines. When held before a strong light this paper presents a uniformly even appearance in some cases, while in others a mesh of fine, uniformly spaced dots is evident. Laid paper, when given the same test, shows a series of parallel lines. These lines may be spaced very close or far apart and may be crossed at intervals by similar lines. Granite or Silurian paper usually appears colored slightly due to the presence of fine unbleached fibers.

It may be necessary to use a magnifying glass to determine whether the specimen is on granite or ordinary colored or toned paper. This granite paper may be either wove or laid, although nearly all such paper used for stamps is wove.

Watermarks are designs which cause the paper to appear more transparent where they occur. They are impressed in the

(Continued to page 50A)

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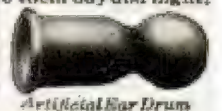
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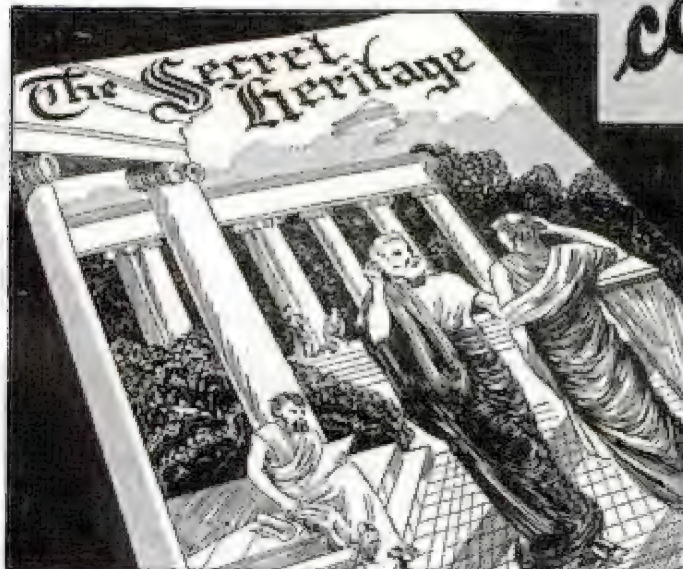
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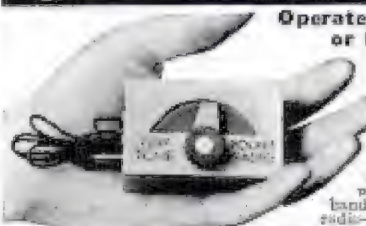
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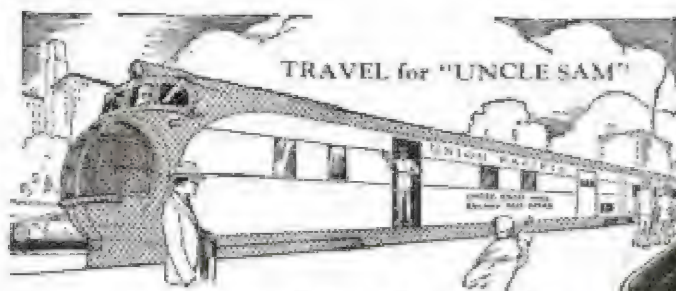
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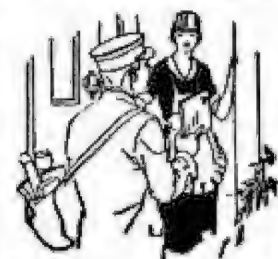
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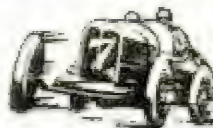
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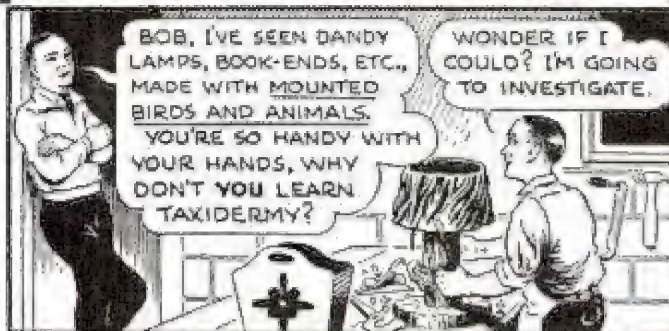
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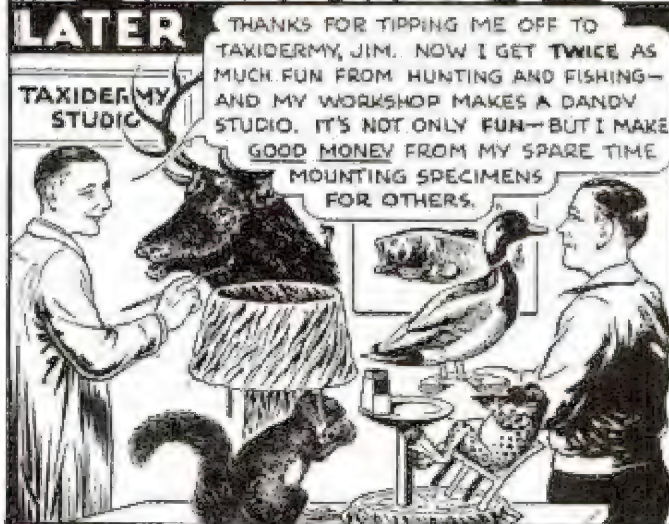
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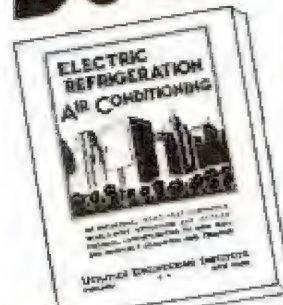
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Please attach a letter giving age, occupation and the name and address of your
employer and that of at least one business man as reference.

STAMPS and COLLECTING

(Continued from page 42A)

pulp during manufacture, and may be
used in both wove and laid paper. All the
papers may be colored by dye. A few
stamp papers are "surface colored," by ap-
plying a thin coating of color upon the
finished paper. Silk paper has a few silk
fibers scattered through it and some vari-
eties of safety thread paper have contin-
uous silk threads imbedded in them.

Army and Navy Heroes Issues

The first values of the much advertised
sets of stamps to commemorate national
heroes of the army and navy are appear-
ing. These issues were originally announced
last May. The one-cent values were final-
ly placed on sale on December 15. The
one-cent stamp for the army shows the
portraits of George Washington and Na-
thaniel Greene, on either side of a view
of Mount Vernon. The one-cent value for
the navy shows John Paul Jones and John
Barry flanking a view of naval vessels of
their time. The two-cent stamps will show
Andrew Jackson and Zachary Taylor for
the army, and Thomas MacDonough and
Stephen Decatur for the navy. The three-
cent values show U. S. Grant and W. T.
Sherman, and David G. Farragut and Da-
vid D. Porter. Robert E. Lee and Stone-
wall Jackson are scheduled for the four-
cent army stamp, while Admirals Dewey,
Sampson and Schley will adorn the four-
cent navy stamp. The five-cent values
have been given over to views of the mili-
tary and naval academies at West Point
and Annapolis. These latter will have
their first-day sales at the cities men-
tioned, but all others have been or will be
placed on first-day sale at Washington.

The Lesser Gold Coins

Although a pattern piece of a one-dol-
lar gold coin was struck in 1836, regular
minting did not begin until 1849. One-dol-
lar gold pieces were minted at Philadel-
phia from 1849 until 1889; at Charlotte,
N. C., from 1849 until 1855 and again in
1859; at Dahlonega, Ga., from 1849 until
1860; at New Orleans from 1849 until 1853
and also in 1855; at San Francisco in 1854,
and from 1856 until 1860, and again in 1870.
Since 1902 the Philadelphia mint has
coined eleven varieties of commemorative

(Continued to page 74A)

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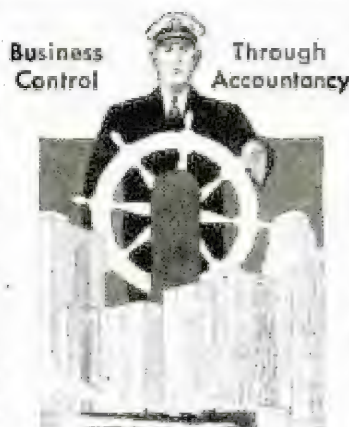
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NEWEST Mechanical merchandiser sells 36 different confections. Big money maker. Sold on exclusive franchise. Write for details to 209 United Bldg., Louisville, Ky.

START Your own business. Be independent. Proven income \$300-\$400 monthly. Can start as part time. Protected A1 merchandise (trade mark). Retail \$3.99, cost you 75c. Act quickly for this rare opportunity. Details. Beyer Mfg. Co., 4635 Lincoln Ave., Chicago, Ill.

MAKE Artificial marble, glossy tiles, uncanny. Tabletops, plaques, floors, whetstones, novelties. Inexpensive, hard, fireproof, cement secrets. Brilliant tile and liquid rubber samples 3c. John A. Paya, 945 Grande Vista Avenue, Los Angeles, Calif.

NEW Method—Mail order business. Big money in spare time. Experience unnecessary. Baker, 5509 Winthrop, Chicago.

AGENTS—To mail our literature. Good profits. Home business. Maywood, 119 Fifth Ave., New York.

24 SELECTED Opportunities to start a business of your own. \$1.00 postpaid. Particulars free. Act now! Kubelka, 58 East 106th, New York, N. Y.

OBTAIN Capital needed for any purpose. Particulars free. Capital Service, Jefferson City, Missouri.

SELL By mail: 19 complete copyrighted plans, 25c coin. Pricerite, 58 N. 14th, Hawthorne, N. J.

INVEST In your future—New folio tells how to make money quickly and honestly. Details free. Morrison, Pontotoc, Miss.

CORRESPOND For newspapers: Profitable, interesting. Easily learned. Write Publishers' Service Bureau, 4258-F Drexel, Chicago, Ill.

DOLLARS Daily! Start home! Mailorder business. Details, Duffy, Covington, Ky.

PROFIT With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, RD-1142 Sunnyside, Chicago.

COMPLETE Money making plans free! National Service, 7026 Normal, Chicago.

DISTRIBUTOR For new products and appliance line. Liberal commission. Walters, 226 Monterey, Detroit, Michigan.

BARGAINS—Paint spray outfit, gasoline engine drive. Terms—trial. Heinick Paint Spray Exchange, M-274, Troy, Ohio.

MAKE Walksmaps—A new business. Write for details on this fascinating new money-making business. Bass Camera Company, 179 W. Madison St., Chicago, Ill.

WE Start you in business, furnishing outfit and instructions, operating "Specialty Candy Factory" home. Men and women, earn \$25.00 up to \$50.00 weekly, all or spare time. Booklet free. W. Hillyer Ragdale, Inc., Drawer 4, East Orange, N. J.

10 CENTS Brings copy of mail dealer, and big mail. Guilford Service, Aurora, Nebr.

HOW And where to obtain capital fully explained, free particulars. Star Service, Wapakoneta, Ohio.

GET Lots of mail. Your name in 10,000 opportunity directories, 25c. Roscoe, 4627 Glenhurst, Cincinnati.

EARN Money acting as rent collector. All or part time. Also fine side line for real estate men. Modern method gets results. Circular free. Slocan, 2638 Obear, St. Louis, Mo.

FREE Circulars describing hundreds of money making opportunities selling by mail. Build your own business. Write now. Progress Publishing Co., Box 1936-H, Milwaukee, Wisconsin.

HIG Mails 10c. 20,000 directories service. Norton Wynn, Lamar, Mo.

"1,000 WAYS To Make \$1,000.00." You can do it—others have. This new amazing book will startle you. 475 pages only \$2.50. Popular Mechanics Press, Room (C36), 200 E. Ontario St., Chicago.

BUSINESS Of your own. No capital required. Details. Wun Service, California, Pa.

BOOK Contains 700 formulas. 50c postpaid. Illinois Universal, 3112 Madison, Chicago, Illinois.

CONSULT Miller free regarding any manufacturing problem, newest specialty, formula, process, analysis you're interested in. Get my interesting literature describing newest discoveries, modern recognized products. All lines. 38 years of unequalled service. Miller, Analytical Chemist, Miller Building, Tampa, Fla.

BE A Perfumer, retail, or mail order. Hardly any capital. Free instructive booklet gives plans of operation. Call-Blossom Perfume Syndicate, Alhambra, Calif.

FREE Literature—Hundred business ideas. Merritt Co., 14 Steuben St., East Orange, N. J.

BRINK'S Trade Directory—The most complete ever published for salesmen, agents and mail order dealers. Price 50c. M. Devine, 820-M, Wrightwood Ave., Chicago, Ill.

500—1936 NAMES Of opportunity seekers. 50c. Trial hundred 10c. Carl Edquist, Odessa, Minn.

SUCCEED With your products. Make-sell them. Formulas, Processes. Accurate analyses. Catalog free. B. Thaxly Company, Washington, D. C.

NO Boss! Sure cash! Silvering mirrors, autographs, reflectors. Combination outfit. Write Sprinkle, Plater, 127, Marion, Ind.

CHEMICAL Expert furnishes manufacturing formulas with complete working directions. Reliable individual services. Charges reasonable. Dr VanHeeden, 1410 East 54th, Chicago.

SELL By mail. Books, novelties. Bargains! Big profits! Particulars free. B. Elfen, 438 North Wells, Chicago.

CHARTERS: Delaware; best, cheapest; free forms. Colonial Charter Co., Wilmington, Del.

MANUFACTURE Polishpuffs. Amazing proposition 10c. Particulars free. Hickory-dell, Glenbeulah, Wisconsin.

ARTIFICIAL Marble sanitary flooring. Instructions covering wood or cement flooring $\frac{3}{4}$ inch thick, fireproof, all colors, low cost, ornamental casting, concrete, plaster, papier-mache, garden furniture, statuary, flexible molds, particulars free. Chris Mahler, Elmont, N. Y.

MAIL Order business is your opportunity. Many began small, now earn thousands yearly. No personal contact. Boundless opportunities. Have had over 30 years experience; will help you succeed. Send 25c for valuable booklets, none free. B. Breniser, 257 South 21st, Philadelphia.

I WANT To send you proof of the wonderful pulling power of Popular Mechanics Magazine's classified pages. What's your proposition? Write me today. F. W. Johnson, Manager Classified Advertising, 200 E. Ontario St., Chicago, Ill.

FREE Booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

COMPLETE Chemical service, analysis, formulas, processes, trade secrets. Particulars free. W. L. Cummings, 228 Gordon Avenue, Syracuse, N. Y.

POPCORN, Crispette, caramels, potato chip, salted nut machines. Long Eakins, 1960 High St., Springfield, Ohio.

MAIL Order and local business. All office. No canvassing; no stock; no shipping. Part of national chain. All instructions given. Shoestring capital. Circular free. Harrigan, P.O. Box 97, Drexel Hill, Pa.

START Little business anywhere. Everything furnished. No canvassing. Maywood, PM-923 Broadway, New York.

YOUR Old plans—regardless of original cost—taken in exchange for my new, original 1000-In-One-Plan. Details free. Write at once. National M. Agency, 2045 Snyder Avenue, H. Philadelphia, Pa.

MONEYMAKING OPPORTUNITIES

MONEYMAKING Projects for woodworkers. Two for 30c coin. Interesting circular free. Woodcraft Service, Plainview, Minnesota.

"20th CENTURY Business Encyclopedia." Book full of money making plans, formulas, manufacturing processes. One plan brought \$250,000.00 business in one year. 144 pages. Postpaid \$1.00. Richard Supply Co., Dept. B, 2514 Mt. Auburn St., Augusta, Georgia.

BIG Winter profits with the new Champion Electric Skate Sharpener. Circular free. Carl Janer, 75 Walker Street, New York, N. Y.

"FINANCIAL Independence"—New dollar copyrighted book money making opportunities, formulas, ideas. Sample, with wholesale prices, quarter. Self-Help, Twin Peaks, California.

PULL In the dollars with the "Money by Mail" system. Particulars free. B. Bowen Company, American Bank Building, Portland, Oregon.

1,000,000 ARTICLES Wholesale. Latest directory, 10c. Jelsmith, 163 Myrtle, Waltham, Mass.

107 PLANS For making \$20-\$100 weekly in home or office business of your own. Descriptive booklet free. Elite Co., 214 Grand Street, New York.

NATIONWIDE Profitable propositions. Details, stamp. Erers, Box 66PB, Elmhurst, N. Y.

"PROFITABLE Ideas" Magazine, 6 North Dearborn, Chicago. 50 moneymaking pages, 10c. "Mail Dealers Wholesale Directory," 25c.

NEW "By Mail" distributing business. Free details. Dollar plan, "Building Mail-ling Lists," 10c. Merchants Sales, 617M North Second, Milwaukee, Wis.

FIFTY Money-making opportunities, 25c. Carl Greiner, 5112 N. Oakley Avenue, Chicago, Illinois.

MAKE Your telephone pay. Inst. 25c. Phone-guide, 3105 32 Ave. So., Minneapolis, Minn.

10c BRINGS Copy National Mail Order News, Box 1772PM13, Roanoke, Virginia.

DOLLARS Daily by mail. Bulletins free. Write now. Tell Service, P1431 Broadway, New York.

FREE! Profitable circular mailing instructions. Mail-service, 2231 McKinley, Berkeley, Calif.

FREE Particulars! Exceptional money-making opportunities. Sinclair, Box 801, Hollywood, Calif.

TREMENDOUS Money making opportunities in new 1937 Mail Promotion Bureau. Particulars free. Sawyer Specializations, Newton Highlands, Mass.

FREE!! New, unusual, spare-time money-making business. Including samples printed matter. Fleischer, 4 W. Huron, Chicago.

TO Win success you must do something different; particulars free. Publishers Sales Company, Box A-76, Nelson, Georgia.

BUILD New batteries from old. Latest achievement. Cost \$1.58. Battery Laboratories, St. Paul, Minnesota.

OPPORTUNITIES For money making. Summit Press, Box 123, Jackson, Mich.

\$250.00 BUYS Neon sign plant complete. Illustrated glass blowing book teaches you the trade. Learn the easy way. Earn big profits in neon signs. Details free. Wholesale Neon Supply, Sheboygan, Wisconsin.

FREE Circulars describing hundreds of money making opportunities selling by mail. Build your own business. Write now. Progress Publishing Co., Box 1936-G, Milwaukee, Wisconsin.

FORTUNES In home manufacturing. Booklet free. Ogg Laboratories, Tampa, Florida.

1000 MONEYMAKING Ideas, book 50c; literature free. Harvey Teeple, Decatur, Ind.

MILLIONS Jobless! Get dollars in mail daily, like we do, for amazing employment information (got man 76 jobs). Keep money; we fill your orders free. Stamp brings details. Co-Operative Service, 77 Swan, Buffalo.

BIG Money at home plating auto parts, reflectors, mirrors, chandeliers, by late method. Experience unnecessary. Free particulars. Gunmetal Co., Ave. N, Decatur, Ill.

FORMULAS, PLANS, ETC.

67 PLANS, 20 Formulas 25c. Jelsmith, 163 Myrtle, Waltham, Mass.

MAKE A real stone cleaner. Guaranteed. Formula 50c. F. Schuller, 1928 University Ave., Bronx, New York.

SOLDERING Aluminum. Formula \$1. Simple, inexpensive, permanent. Gerwin, Shawnee, Oklahoma.

GUARANTEED Formulas—New fast sellers. None better. Lowest prices. Catalog free. Kamico, 49th, Park Ridge, Ill.

SUCCEEDED As your own boss. Manufacture fast selling products, paying good profits. Details. VG Chemical, Box 4651, Pittsburgh, Pa.

FORMULAS—Money-making ideas. Literature free. Hoy Service, Valley Junction, Iowa.

TESTED Formulas. Free consultation; details. Kaplan, 13 S. Eden, Baltimore.

FORMULAS—Newest, profitable, unexcelled. Write for unequalled special offers. Philarat, Jefferson City, Missouri.

550 MONEYMAKING Formulas 20c. Ideal Book Shop, 178, Park Ridge, Ill.

FORMULAS And analysis. Modern, all types created. Gallagher, % Goods Drug Store, Allentown, Penna.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

FORMULAS—Latest best sellers. List free. Persian Laboratories, Bay City, Mich.

MAGIC Soap, cleans everything. Money maker. Formula 30c coin. Fair Deal Agency, Amarillo, Texas.

CERTIFIED Formulas, best science can produce for making popular, biggest-selling specialties. All lines. Before buying formulas, get my valuable "Eye-Opening" literature, including free subscription to Miller's Monthly Messenger. Miller, Chemist, 1704-A, Tampa, Fla.

SUCCEED With your products. Make-sell them. Formulas, Processes. Accurate analyses. Catalog free. B. Thaxly Company, Washington, D. C.

FORMULAS—Latest money makers. Literature free. Belfort, 4042 N. Keeler, Chicago.

10,000 MONEY-MAKING Formulas. Tells you how to make and sell almost everything under the sun; cosmetics, marriage, anti-freeze solutions, battery solution, beverages, cheese, chewing gum, cleaning preparations, extracts, hair preparations, inks, bluing, leather polish, mirrors, perfumes, polishes, typewriter ribbons, carbon paper, washing powders, liquid soap, and hundreds of other profitable articles. \$4 postpaid. Popular Mechanics Press, Room (C36), 200 E. Ontario St., Chicago.

CHEMISTRY

FREE Chemistry catalogs. Supplies at 5c! Equip complete laboratory. Send 10c (refundable for postage and handling). Kemkit Scientific Corp., 135P Johnson Street, Brooklyn, New York.

SUPPLIES For chemistry students. Catalogue 5c. Book catalogue free. Handbook for chemical experimenters, hundreds of instructive experiments, 50c. Reading Scientific Company, Reading, Penna.

SEND 25c For new illustrated chemical experiment book with over 300 formulas and tests. Also receive 32 page illustrated catalog of apparatus, microscopes, telescopes and chemicals free. F. Winn, 124 West 23 St., New York.

RESEARCH. Experiments, magic—three months subscription—15c. Spanera Chemistry Magazine, 100 Forsyth, New York.

CHEMICALS. Laboratory glassware, apparatus. Send 3c for catalog CP. Biological Supply Company, 1176 Mt. Hope Avenue, Rochester, New York.

CHEMICALS In 5c quantities. Catalog 5c. Fleischer's Laboratories, Everett, Massachusetts.

HELP WANTED

ENJOY Good weekly pay while learning landscape work. No money or experience needed—we train you free. Work in home county full or part time. Old reliable company. Brown Brothers Nurseries, Dept. 141, Rochester, New York.

LOCAL Agents wanted to wear and demonstrate free suits to friends. No canvassing. Up to \$12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples free. H. J. Graves, Pres., 1300 Harrison, Dept. P-817, Chicago.

IF You want to get groceries and household supplies at wholesale, and a wonderful chance to make up to \$15 in a day besides, send me your name immediately. No experience necessary. New Ford sedans given to producers as bonus. Albert Mills, 2246 Monmouth, Cincinnati, Ohio.

CASH Paid for butterflies, insects. See Sinclair Display Advertisement on page 16A.

EARN \$10.00 Daily commission selling absolutely finest, guaranteed, specially constructed shoe; garages, mechanics, delivery men; free samples. Dura-Tex Shoe, 1010 Center, Brockton, Mass.

USE \$500.00? Raise canaries for us. Free particulars. Canary Guild, 3741-B, 60th Street, Woodside, N. Y.

AGENTS WANTED

"SNAP-UP" Gas tank locks. Electric, push button control, compact, attractive, reliable. Price \$4.00. Agents wanted. Steele Brothers Co., 445 Winchester, Ashland, Kentucky.

MEXICAN Feather pictures. Unusual novelty. 50c (stamps) bring \$2.00 worth samples, details. Refunded if unsatisfied. Mexican Art. Apartado 1593, Mexico City.

MONUMENTS, Markers, beautiful enduring granites \$8 up. Free catalog, samples. Agents wanted. Mitchell Monument Co., St. Cloud, Minn.

STRANGE Ironing cord. Saves electricity. Abolishes scorching and blinking. For telephones also. 150% profit. Sales guaranteed. Big free offer. Neverknot, Dept. 2A, 4525 Ravenswood, Chicago.

450% PROFIT In new automatic gas lighter. No flint or flame. Lights gas instantly. Retail \$25c. Costs you \$1.00 a dozen or 15 dozen for \$8.00 postpaid. Sample 10c. New Method Co., Box PMG-50, Bradford, Pa.

NEW Cleaner—Amazes everybody. Cleans everything. Washes clothes snow-white quickly. Spots, stains removed like magic. Startling demonstrator. Free samples make fast sales. Quick repeater. Immense profit. Write quick for "free sample." Super-X Cleaner Co., 11, Berwyn, Illinois.

MEXICAN Curies. Free particulars, samples 10c stamps. Apartado 1176, Mexico City, Mexico.

SEND 50c For false-tooth brush that does not soften, recommended by dentists. One each household and mechanics' brush included. Postpaid. Money back guarantee. Agents wanted. Palm-ett Brush Co., Umatilla, Fla.

WHOLESALE Catalog free. 500 heat sellers. Poly Co., 1107 Broadway, Somerville, Massachusetts.

500% PROFIT Selling new "20-in-1" kitchen utensil. Retail \$25c. Costs you \$1.00 a dozen. \$7.20 a gross. Sample 10c. New Method Co., P.M.G.-50, Bradford, Pa.

NEW Discovery—Liquid window shade cleaner. Trial pkg. 25c. Porter Advertising Service, Box 3123, Knoxville, Tenn.

ROUTE Men wanted. Local grocery routes paying up to \$45 in a week. Automobile given producers as bonus. Write Albert Mills, 2246 Monmouth, Cincinnati, Ohio.

AGENTS! Dresses 35c. Men's suits \$1.50-\$2.00, shirts 40c, ties 6 1/2c, chiffon hose 42c. Amazing prices. Big profits. Catalogue free. Acme, Alt-558 W. Roosevelt, Chicago.

\$0.00 HOURLY. Amazing Karna refinishes auto like new without rubbing, polishing, waxing or painting. Wipes on with cloth. Lasts 8 to 12 months. Free sample. Karna, Dept. L-8, Cincinnati, Ohio.

300% PROFIT In new self-starting no-flint cigar lighter. Retail \$5c. Sample 25c. Get details quick on wonder seller. New Method Co., Box PM-50, Bradford, Pa.

AMAZING Iron-So-Ezee-Ironing switch. Saves electricity! Prevents scorching! Makes ironing easy. Needed in homes. Big seller. Iron-So-Ezee Company, Mt. Washington, Ohio.

PROFIT With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, 8D-1142 Sunnyside, Chicago.

CASH Paid for butterflies, insects. See Sinclair Display Advertisement on page 16A.

FREE Clothing, big money daily selling quality raincoats, jackets, overcoats. Lowest prices! Samples free! Goodwear, 712-AC Roosevelt, Chicago.

BIG Profits selling powdered hand cleaners, get our low bulk prices. Sell under your own name. Kleensick Co., 1992 E. 5th, St. Paul.

5c WILL make you 75c profit. Free sample of product. Free literature. Stanley Products, Lansing, Mich.

LINDBERGH Stamps, covers, commemorating tenth anniversary Paris landing, next May. Prudhomme, 1516 Masonic, San Francisco.

SELL Slogan signs. New catalog free. Special. Kut, Sidney, Ohio.

SELL Air cushion insoles. Sample 35c. Hanlan, 2911 Van Buren, Los Angeles, Calif.

BUY Wholesale 1000 bargains. Catalog free. Products Company, Gary, Indiana.

MEN—Women \$3 to \$6 daily. Selling 25c household necessity that repeats. Three to ten sold in every home. Free sample. Write Puro Company, 3107 Pine St., Dept. B-2047, St. Louis, Mo.

BIG Money and fast sales. Every owner buys gold initials for his auto. You charge \$1.50, make \$1.45. Ten orders daily easy. Write for particulars and free sample. American Monogram Company, Dept. 40, Dunellen, N. J.

AGENTS: Smash go prices. Santos coffee 12c lb. 4-oz. vanilla 8 1/2c. Razor blades 10 for 8 1/2c. 100 sticks chewing gum 12c. 150 other bargains. Premiums. Experience unnecessary. Carnation Co., P.O. St. Louis, Mo.

500% PROFIT! Gold reflecting letters for store windows. Large sizes 1c. Free samples. Modernistic Sign, B-3004 Lincoln Ave., Chicago.

SELL Neon signs. Big profits. Sample—\$3.95. Free details. Wholesale Neon Supply, Sheboygan, Wisconsin.

SELL—Blade conditioners—Smoother shaving, millions being sold. Marvelous. Order sample, details quick. Twenty-five cents. Charlton Corporation, Chicago.

NO Boss! Sure cash! Silvering mirrors, autoparts, reflectors. Combination outfit. Write Sprinkle, Plater, 128, Marion, Ind.

SUCCESS With your products. Make-sell them. Formulas. Processes. Accurate analyses. Catalog free. R. Thaxly Company, Washington, D. C.

WHY Work for others? Make and sell your own goods. Formulas, toilet articles, perfumes, extracts. Valuable book free. Scientific Laboratories, 1950W Broad, Richmond, Va.

ENGRAVED Name plates, numbers, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

MAN In each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers, by late method; experience unnecessary. Simple plan of manufacturing at home starts you in big money making business. Free particulars and proofs. Gunmetal Co., Ave. H, Decatur, Ill.

GENTLE Gold letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 418-B North Clark, Chicago.

BIG Money applying gold initials on automobiles. Easiest thing today. No experience needed. Free samples. "Ratco," 1084 Washington, Boston, Mass.

FREE Sample—Amazing cleaner; sells homes, taverns, everywhere. Big profit—fast repeater. Beta, 5007 Irving Park, Chicago.

SELL Novelty fun cards, novelties, etc. Samples 10c. National, Box 500M, Cincinnati.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

AGENTS—Opportunity to make money; book containing 107 successful business plans; home or office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

WANTED—District purchasing agents. No experience or money required. Write Purchasing Manager, 174 N. Halsted, Chicago.

COSTS 1c—Sells 25c. Make non-explosive cleaner from benzene crystals. 1c gallon. Sample 10c. Literature free. Western Reserve Laboratories, 6615 Denison Ave., Cleveland, Ohio.

DO You want agents for your proposition? Your ad in this space will place your message before hundreds of men seeking fast-selling products. My folder "How to Secure Agents" is filled with proof. I'll gladly send you a copy free. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 290 E. Ontario St., Chicago.

PROFITABLE Home business. Legitimate. No canvassing. Maywood Publishers, P-923 Broadway, New York.

GOLD Reflecting letters for store windows. Easily applied. Large sizes, penny each, free samples! Atlas Sign Works, 7941 Halsted, Chicago.

HIGH-GRADE SALESMEN

SELL Only (4) all wool suits to get yours without cost. No limit to number of suits you may earn. Prices \$14.95 to \$26.95. Zipper leather carrying case. Sample line free. No experience needed to make big money. All suits individually cut and tailored to measure. Satisfaction or money back guarantee. Three Star Clothes, Dept. 36F, 330 So. Franklin, Chicago.

IMMEDIATE Openings for ambitious men! Wear, introduce "Fairbanks" tailored-to-measure clothes, make up to \$10 in a day. Experience unnecessary. Free suit offer. Low prices. Quick sales. Free outfit. Permanent! Fairbanks Company, 2243-A Wabasha, Chicago.

MAN Wanted—by shoe manufacturer established 34 years, for sales work. Ready cash daily and extra bonuses to producers. No experience needed. Your own shoes at factory prices. Sales outfit sent free. Write Mason Shoe Manufacturing Company, Dept. A110, Chippewa Falls, Wis.

YOU Get paid first. Take orders for 20 home necessities. Pay after you collect. Big profits. Write Ho-Ro-Co, 2791-R Dooler St., St. Louis, Mo.

BIG Money selling advertising book matches. Amazing low prices. Wonderful full time or sideline. Liberal commissions paid daily. Free elaborate outfit. Regal Match Co., Dept. 52, Hamilton & Gladys, Chicago.

SELL Celluloid and cardboard pricing tickets, steel shelf moulding, changeable signs, menu covers. Every store prospect. P. Pricing Press, 124 White St., New York.

SALESMEN: Sell advertising novelties, calendars, fans, thermometers, etc., for nationally known firm. Liberal commissions. Stanwood Hillson Corp., 21 Station St., Brookline, Mass.

WE Need experienced salesmen for a real money making article. Wide sales field with exclusive territory. Richmond Chemical Company, Silver Spring, Maryland.

NEW Punchboard line. Free 32 page full color catalog. Nothing to carry. Larger cash commissions daily. Season now! Lea-Moore Co., 180 Adams, Chicago.

STRANGE Chemical sponge cleans wall-paper like magic. Banishes housecleaning drudgery. Women amazed. Hustlers cleaning up. Details free. Krstace, Dept. 251, Akron, Ohio.

MAN Wanted to supply Rawleigh's household products to consumers. We train and help you. Good profits for hustlers. No experience necessary. Pleasant, profitable, dignified work. Write today. Rawleigh's, Dept. B-53-PPM, Freeport, Ill.

SELL Nothing! \$95.00 weekly. \$500.000 punchboard firm announces new, no investment plan. Season starting. K&S, Dept. C122, 4329 Ravenswood, Chicago.

DISTRIBUTORS. Responsible salesmen. Loud-speaker and inter-rail systems for business places, restaurants, etc. This is a package proposition requiring no specialized knowledge. Quality equipment at attractive prices. Excellent opportunity for above the average type man. Electro-Vox, 75 Pearl St., Hartford, Conn.

BEAUTIFUL Kid furs, rugs sell quickly. Gonzalez, Penasur 810, Monterey, Mex.

LINDBERGH Stamps, covers, commemorating tenth anniversary Paris landing, next May. Prudhomme, 1516 Masonic, San Francisco.

LARGE Illustrated coin books cost you 25c, sell for 50c; send 35c for sample. Coin-shop, 2510 Chester, Alameda, California.

BRAND New guaranteed business stimulator—all merchants. Big cash commission. Repeats. Sales outfit free. Merchants, 18 South Clinton, Chicago.

CHANCE To get free tailored-to-measure suit right away! Wear it! Show friends how to save up to \$10. Take orders. Make up to \$7 per suit including free suit and cash bonus. Every suit hand cut—custom tailored—100% all wool. Money back guarantee. No limit to number of free suits given you. Fine traveling case—large samples free. O. K. Tailoring Company, 525 S. Market, Dept. 122, Chicago, Ill.

SALESMEN: Everybody now buying book matches, labels, salesbooks, garage forms, blotters, calendars, pricing sets, business stationery, etc. Free deals. Wonderful sideline. Comm. daily. Sales portfolio free. Willens, Dept. RB, 2110 Gladys, Chicago.

EXCLUSIVE! Large advertising book match factory wants salesmen: full or part time. G. G. made \$278 in 1 week. Big comm., amazing repeats. Permanent, dignified business. Free kit. Match Corp. of America, Dept. E-2, 6041 Grand, Chicago.

PRINTING Salesmen—100 salesbooks for \$4. Advance commission \$1. Quick delivery. Every merchant a prospect. Free outfit. Harrison Salesbook, Inc., 290 Broadway, Boston, Mass.

POIRER Earned \$127 one week. Wilbur \$37.10 in 9 hours. Wonderful opportunity. Introduce startling guaranteed hostelry service. Hostlers free as bonus, send size. Write quick. Wilkoff, Desk 2337, Greenfield, O.

PROFITABLE Selling Quintuplet mail boxes. Prospect every house. Send \$1 for sample, sales plan. Extra Quintuplet first dozen. Satisfaction guaranteed. Walfrid Mfg. Co., Racine, Wis.

CLEAR-VIEW: New winter product for auto glass. Tested and proven to 20 below zero. Guaranteed. Cellulose Products Co., Enid, Okla.

MEN—\$500.00 Weekly selling fur coats. Rimer-Dicker, 282 7 Ave., New York.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Ferrell cleared over \$1,000.00 monthly. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

TRUCK Covers. Complete line water-proofed canvas. Thousands of trucks in your state constantly buying. Open price line. No competition. Michigan Tarpsault Co., Grand Rapids, Mich.

EXCLUSIVE Territory for established auto route jobbers. Steady profitable demand for every store counter. Bur-Lite, Hudson, Ohio.

BE Your own boss. Make the largest commissions selling our complete line of brushes. Write for sales plan. Wire Grip Sanitary Brush Corp., 229 Southern Boulevard, N. Y.

BRUSH Salesman—If you ever sold brushes write for our money making proposition. Donald Brush Co., Camden, New Jersey.

FREE Booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

SALESMEN—New deal guarantees stores \$10 for one. Two \$15 sales net you \$20 daily. Sayers, 2801-123 Sheffield, Chicago.

SOMETHING New in fire extinguishers—Red Comet Automatics. Proved in west five years. Exclusive territory. Low price opens pocketbooks. Write, Red Comet, 404 Comet Building, Littleton, Colorado.

EDUCATIONAL AND INSTRUCTION

TIMESTUDY. New practical home training. Rapidly growing field for conscientious workers, with mechanical experience, ambitious for advancement into executive positions. Dix-Staunton School of Timestudy, Rochester, N. Y.

BE A radio expert—Many make \$30, \$50, \$75 a week. Learn at home in spare time. Radio's big growth making many good full time and spare time jobs. Write for free copy of 64-page book. National Radio Institute, Dept. 7BPA, Washington, D. C.

HOME Study courses leading to degrees: Arts and sciences, philosophy, education, law, letters, theology, psychology, engineering, chemistry, business and commerce. Many others. McKinley-Roosevelt College of Arts and Sciences, Chicago.

SECRET Service. Particulars free. Write immediately. George Wagner, M-2640 Broadway, New York.

GOVERNMENT Jobs. Start \$105-\$175 monthly. Men-women. Prepare now for next examinations. Many Social Security jobs. Full particulars free. Write today sure. Franklin Institute, Dept. W3, Rochester, N. Y.

BIG Bargain catalogue educational matter 10c. Handling, Y-799 Broadway, New York.

BECOME Business Investigator. Earn \$1.00 hourly, upwards—spare time. Experience unnecessary; we teach you. Details free. Business Detective System, 1009 Oak, Elmhurst, N. Y.

BECOME An Investigator—Secret service agent. New "Test Problem Method." Develops your ability. Particulars free. International Secret Service Institute, (PM27), Hoboken, N. J.

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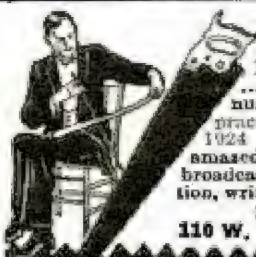
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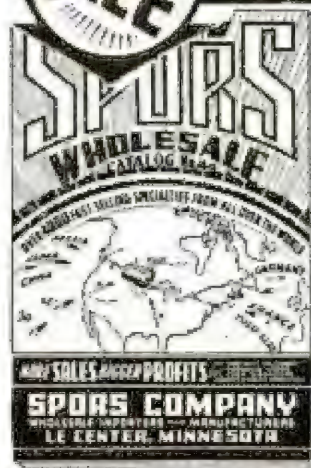
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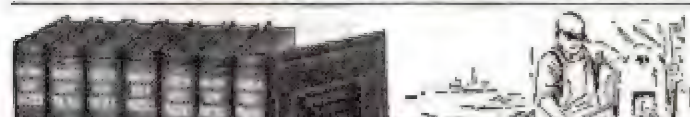
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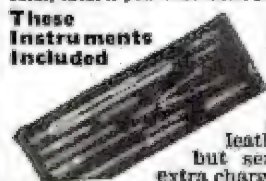
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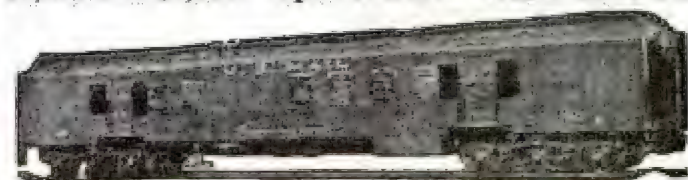
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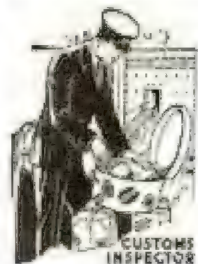
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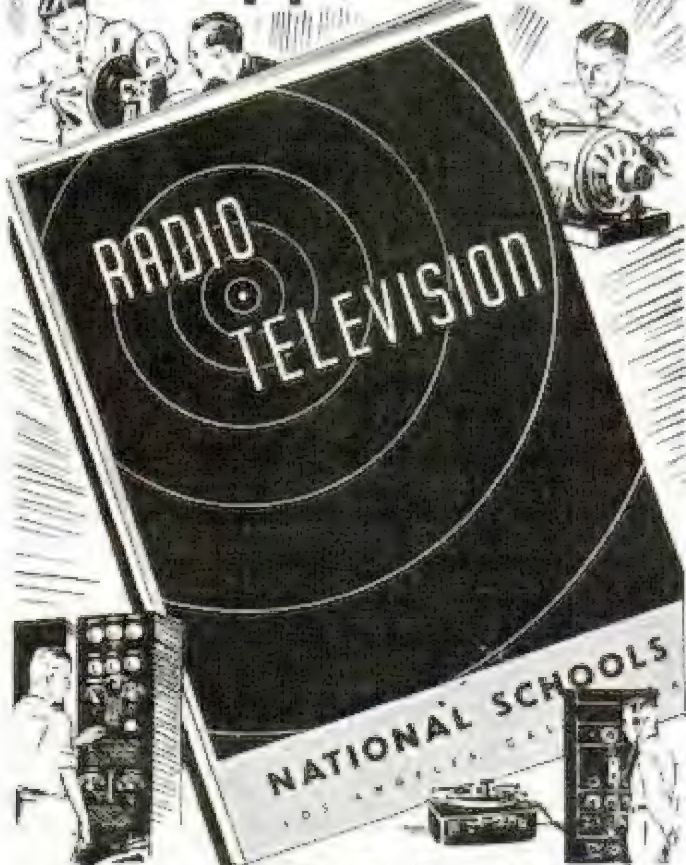
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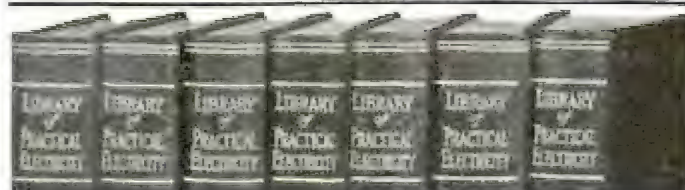
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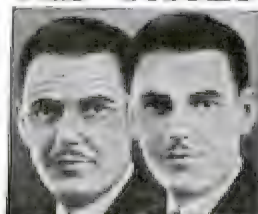
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STAMPS and COLLECTING

(Continued from page 50A)



Recent foreign stamp issues, including some by Great Britain for nationals in Morocco, and several air-mail stamps issued by various countries

gold dollars. Most of the regular gold dollars of the Philadelphia mint are priced at about six dollars for uncirculated copies, but there are a few scarce dates, one of which is listed at \$150. All coins of the Charlotte mint list above ten dollars and one date is priced at \$2,500 for a copy listed only as very fine. Those of the Dahlonega mint range from six dollars to about \$350 for uncirculated copies. Those minted at New Orleans are priced at from five to fifteen dollars and those from San Francisco at from fifteen to \$150. The commemorative gold dollars are worth from four or five to twenty-five dollars.

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The third row contains two examples of air-mail stamps. The first is the ten-franc value of the French issue commemorating the aerial conquest of the South Atlantic. The other is a more recent stamp of the Dominican republic. The remaining four stamps show the four designs of a new long series issued for the French colony of French Western Africa.

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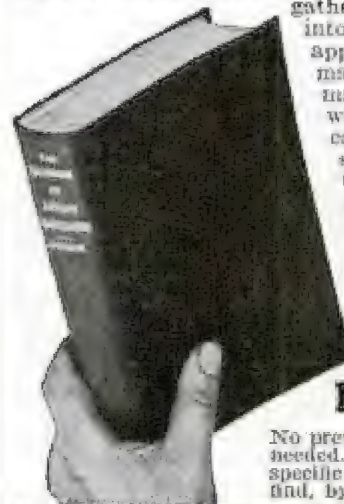
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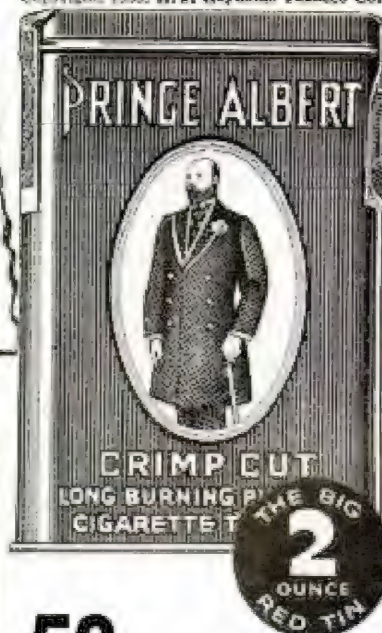
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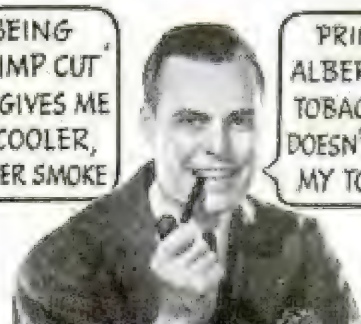
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FEBRUARY, 1937

No. 2

The BURIED TREASURE RACKET

PROBABLY you have heard of magical devices supposed to lead you directly to buried treasure. Recently investigators decided to test one.

They arranged six covered boxes on a table. In one they placed a few gold coins, the rest were filled with various kinds of vegetables. Then they called in the owner of a "scientific gold



Top, diver adjusting air hose before descending to hunt sunken treasure. Bottom, early locks and keys taken from treasure chests and old safes

compass" supposed to point unerringly to precious metals. After a few exploring trips up and down the line of boxes he picked the fourth one.

"That box," he announced, "contains the gold." The box contained a tomato.

In another case, the owner of a "gold magnet" wanted to demonstrate his instrument to a skeptical business man. The owner of the magnet pulled out a large gold watch and left the office while the skeptic hid it. The business man wrapped the watch in thick paper and placed it far back in a desk drawer. Then he raised



Top, left, raising dirt from deep shaft in vain hunt for treasure. Center, "doodle bug" made of aluminum wire is supposed to point out buried treasure. Right, ship's strongbox of early days. Bottom, swivel gun found aboard sunken pirate ship

one of his windows a few inches. The gold hunter prowled around the room, holding his queer device before him. He finally announced the watch was hidden in a supply closet. His "magnet" pulled him toward the closet every time, he declared. Then the business man showed him where the watch really was.

"You locate this watch by its ticks in-

stead of with that stick," the business man told him. "I raised one of the windows to let in a little traffic noise to prevent you from hearing the watch. That made you suppose the only hiding place was inside that closet with its thick walls."

Dozens of useless and

fake machines are being sold for finding buried treasures. People who think there is a fortune just beyond their grasp pay from twenty-five dollars to several hundred dollars for strange looking devices that are worthless. Selling such

instruments is a racket based mainly on the persistent superstition that precious metals give off "vibrations" that can be picked up with so-called divining rods or forked sticks. Science knows of no such vibration that can be detected and the willingness of people to buy and use "doodle bugs" seems to rest in the fact that they believe what they want to believe.



*Left, ruined walls of adobe building where treasure hunters have dug many holes.
Right, early Spanish cannon found by treasure hunters*

In its simplest form, a doodle bug is a forked willow stick, at the fork of which is placed a sample of the material being sought. This "bait" is supposed to be attracted by the buried treasure and to dip toward it when the operator walks over the cache. No matter if you are looking for gold, oil, silver or a lost box of matches, you are supposed to be able to find it with the proper bait. You can buy doodle bugs

of any size or shape to suit your fancy. Magic pendulums, gold detectors, Spanish needles, cylinders containing magnetic sand swinging from six inches of chain, "high-pressure" treasure hunters attached to small batteries to increase the mystery, and "double-strength" divining rods with special compasses to point out gold, all are peddled to gullible purchasers. All of them are equally worthless. One instrument has a special dial with a pointer that you may turn to sections marked "gold," "silver," and so on, depending upon the kind of treasure you want.

Magnetic dip needles have had a wide sale for treasure hunting although gold and other nonmagnetic metals have no effect on such needles. A novice would have trouble in locating even a buried locomotive with the device although magnetic needles have actually been used for such purposes by trained men. When postal authorities stopped one firm from selling mineral rods guaranteed to locate gold 400 feet away, the company began offering the rods free to purchasers of a high-priced book on treasure hunting.

Even if you should see treasure found by some magic device with your own eyes you should still be skeptical. Old coins can be bought by anyone, and it is no trick to "plant" treasure in the ground and then,



Successful inductive electrical apparatus that indicates buried metallic materials

(Continued to page 156A)

Four-Engine Flying Fort Is Largest Land Plane



The army's latest bomber is this huge sixteen-ton flying fortress which is seventy feet long, fifteen feet high and has a wingspread of 105 feet

Giant in its proportions and sleek in its streamlined beauty, the first of thirteen huge bombers being constructed for the Army Air Corps by the Boeing Aircraft company recently rolled from its hangar at Seattle for preliminary test flights. This sixteen-ton aerial defense weapon is the largest land plane in America. It is seventy feet long, fifteen feet high and has a

wingspread of 105 feet. It is an all-metal, low-wing monoplane with retractable landing gear and tail wheel, air-operated wheel brakes, three-bladed constant speed propellers, de-icing equipment and latest type flight instruments and radio equipment. Its 1,000-horsepower engines are expected to supply enough speed to make it the world's fastest bombardment ship.

Window Defrosting Fan Is Run by Shaft from Fan Belt

Driven by a flexible shaft, a motorless fan for defrosting the automobile windshield takes its power from the fan belt of the car. There is no drain on the battery. It is attached to the steering post and adjusted to any position by means of a uni-

versal ball joint, and a hand control regulates its speed from 1,000 to 7,000 revolutions per minute. Two sizes are available, four and one-half inch or three and three-quarter inch. The blades are made of a special aluminum alloy.



Defroster fan mounted on steering post is driven by flexible shaft. Inset shows power takeoff at fan belt

Mineral Treasure in Dead Sea Worth More Than All Gold

Spurned and avoided as worthless for thousands of years, the Dead Sea now is recognized and coveted as a basin filled with minerals of incredible value. Nothing can live in its waters, but through the ages the Jordan river has carried to it the chemical treasures of the desert, and today the Dead Sea holds magnesia, potash and other mineral salts worth more than the gold stores of the nations. To recover these chemicals, used in making matches, cotton goods, glass and many other industrial products, brine is pumped from the lake and allowed to evaporate in shallow basins, leaving the salts to be packed in bags and shipped.

Subscribers, now.

Students Steer Dummy Cars in Driving Class

With drivers' seats and dashboards for classroom desks and a motion-picture screen for their highway, students in a Chicago high school are learning how to drive a car safely. Twelve weeks of "skull work" in the classroom is followed by six weeks of actual driving on a practice field. Police furnished obsolete cars for the indoor study, and these were stripped down to a front seat, steering wheel, clutch and brake pedals, gearshift lever and instrument board. The controls were linked to electric lamps in a panel mounted in front of the class, and with each control movement a lamp is lighted. Movies of traffic situations are projected on the screen and the student's reaction is shown instantly on the light panel. The outdoor practice



Left, driving class in a Chicago high school. Controls of each dummy car are wired to panel of lights in front of room and student's reaction to traffic situation pictured on a screen is instantly recorded by the lamps. Above, traffic instructor administers a vision test.

Lane Tech drive comprises one mile of hard-surface roadway twenty feet wide, with "S" curves and intersections at various angles, grades simulating a railway crossing, and a backing lane for an imaginary one-car garage.



Revival of Electrocution Victims Is Hope of Research

Revival of human victims of industrial electrocution may be made possible through the research of Drs. William T. McNiff and Leonard J. Piccoli of Fordham University. The experimentation is founded on the theory that most deaths resulting from low-voltage electric shocks are caused by suspension of the customary muscular activity of the heart. The experiments prove, the professors assert, that by sending a sixty-five cycle alternating current, constituting a counter shock, through the heart of an animal apparently dead of electric shock, the heart muscles

are restored to normal activity, reviving the animal. The experimenters have not had opportunity to try this method on electrocuted persons, but they believe it practical. The electrodes of the counter-shock apparatus can be applied in a few seconds time to the chest and back of the victim without surgery. According to the investigators, the apparatus was effective in reviving forty out of sixty animal subjects. The counter shock must be applied within four minutes. Where the original shock passed through the head, the method was not successful.

New York



More than 10,000 aerial photographs were pieced together to form this map of Connecticut, so large and detailed that even small houses, hedges and trails can be seen with aid of binoculars.

So vast that it must be examined with field glasses to see details, an aerial photographic map of the entire state of Connecticut was pieced together of 10,479 individual pictures. It is eighteen feet by thirteen, and so perfect in detail that with binoculars the observer can pick out trails and streams, hedges and chicken houses. Aerial survey planes flying at an altitude of 11,400 feet covered the 5,004 square miles of the state and brought down the thousands of photographs. These were fitted into thirty-four "composites," each a mosaic view of a section of the state, and finally into the gigantic state map which is being exhibited at Hartford.

Yeast Is Made from Waste

F. 641 at Paper Mill

Waste liquid at a Canadian paper mill is being converted into yeast, thus utilizing the sugar contained in wood. The process consists of putting the yeast cells to work devouring all the sugar in the waste. Eleven pounds of yeast cells grow into sixteen tons of yeast. Vast quantities of clean air and filtered water keep the yeast free from poisoning and from turning into alcohol. Then the water is pressed out and the yeast is packed in the conventional manner. At present the mill produces 20,000 pounds per week.

Automatic Auto Top Opened
and Folded with Switch

Sudden showers hold no terrors for the driver of a convertible car if it is equipped with an automatic top which can be



Pressing switch releases compressed air and causes this auto top to fold back out of sight

opened or folded by pressing a switch inside the car. The opened top is held in place by compressed air. Pressing the switch releases the air and causes the top to fold back out of sight.

British Bomber Has Revolving Gun Turret

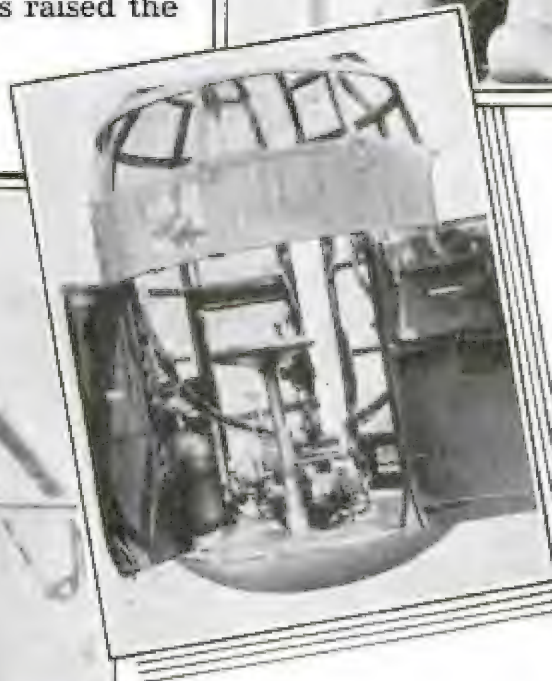
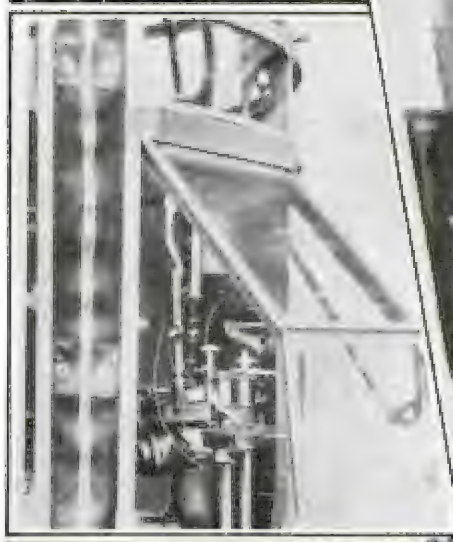
Gunners aboard the latest type of British bomber have little to do except pull the trigger. The gun turret and everything inside it operates automatically. The turret is turned by a compressed-air motor operated in unison with the turning of the gun, power being supplied by an engine-driven, six-cylinder air compressor which maintains pressure at 200 pounds per square inch. This turret also serves as a station for dropping bombs. The gunner plays a game of seesaw with his weapon. He sits on a stool connected to a hydraulic ram which, in turn, is linked to the gun so that the weight of the gunner just balances the weight of the gun. As the gun goes down, the gunner's seat goes up or when the gun is raised the



Revolving gun turret of bomber with gun protruding through "zipper." Left, zipper closed and gunner's balanced seat

seat is lowered. Both gun and seat can be locked in any position and the seat can be adjusted to the weight of the gunner. A roller bearing at the base of the gun makes it possible to point the weapon vertically and the slot through which the gun protrudes can be closed with a "zipper" fastener.

© Charles E. Brown



Painting Autos in Brilliant Colors Might Cut Accidents

If automobiles were painted in brighter hues there would be fewer traffic accidents, Dr. Miles A. Tinker of the University of Minnesota, a psychologist, believes. The colors commonly used today—black, dark blue, dim gray, horizon green, dark green and tan—have low visibility, and cars painted these colors are difficult to see against the gray tone of the highway,

especially at dusk or on a dark, foggy day. The colors most easily visible against a dark background in daylight are respectively white, yellow, green, orange, gray, blue, violet and red. Against a gray background, the best contrast is provided by red, blue, yellow and green. When daylight begins to fail green is the brightest. Maroons and browns lack contrast.

Minneapolis

Hardwood Parquet Floor Made Ready to Lay



Parquet flooring of real hardwood is now available in sections ready to lay, and a room can be floored or recovered with it in a morning. The cost is no more than that of an imitation wood floor covering. The mosaic sections, shipped in cartons, are prefabricated and prefinished at the factory. They are made of individual blocks of hardwood, five-sixteenths inch thick, assembled in basket-weave pattern and imbedded in a semi-pliable grill in two by six foot sections. Light and dark oak, walnut and teak are available in various finishes. A layer of felt is first cemented to the sub-floor, then the hardwood mosaic is fastened over the felt with a special adhesive. There is no sawing, hammering nor dust in laying the floor. Being genuine hardwood, these floors resist wear and the imprinting of heels and furniture.

Parquet floor in room shown above was made of two by six foot sections, one of which is illustrated below as it came from factory, prefinished and ready for laying with special adhesive

Canary Champion Develops Soft Voice in Darkened Cage

Has your canary a championship repertoire? The "roller" canary sings the classic repertoire. The "chopper" is a jazz singer, unable to execute the smooth, soft "tours" the champion must learn to sing. To be a champion, the bird must have in its repertoire at least eight of the thirteen tours a canary can sing. Rollers begin their voice lessons when very young, usually starting in September. They are placed in the company of a good singer and their

cages are gradually darkened over a two-week period. The darkness helps them develop soft, sweet tones essential to a good rating. A piercing trill is bad form; the best voice is soft and low. The "hollow roll," one of the most prized tours, can be executed in ascending or descending pitch and brings twelve points toward championship. The "bass roll" also takes twelve. Perfect execution requires singing with the beak shut.



SERVING early morning tea on one of the 200-mile-an-hour Empire seaplanes. Above, promenade saloon with reclining chairs on one of the new Empire seaplanes. These flying boats carry a crew of five, are eighty-eight feet long and have a wing span of 114 feet.

1947
F1155
world in less than nine days. But, spectacular as this was, their trip actually was a breathless dash around the top of the globe, blazing an uncharted trail without the benefit of any but the simplest navigational and flying aids.

Now, only five years later, we see circumnavigation of the world by air actually accomplished by regular, scheduled commercial transport services. You or anyone else now can fly around the world, covering 24,000 miles in three weeks or less, making almost the entire trip by conventional day flights. Except for Wiley Post's record, you can beat the best time ever made by globe-girdlers, and it is quite likely you may be able to equal Post's time before long because the present time can be cut in half by day-and-night service whenever

Patented by Imperial Airways

the traffic warrants.

Let's assume you are stretching your two weeks' vacation to three to make what you laughingly refer to at the office as a "little trip." Your air road to adventure starts at New York. A short plane trip to Lakehurst, N. J., and you board the German Zeppelin "Hindenburg." Two or two and one-half days later you land at Frankfort, Germany, 4,000 miles from home.

In Europe you have a choice of German Lufthansa and British Imperial Airways, Dutch K. L. M. or Air France. The French line extends to Saigon and the British and Dutch to Java via Singapore. As this is written, there still remains an 850-mile water voyage out to Manila, but by the time you go, it is quite likely that one or all of the European



Fixed aerial

Freight notch here

Hold for bedding

Mail, Freight and
Baggage hold

After cabin for 6 passengers
during day and 4 at night

Forward cabin for 8 passengers
during day and 4 at night



Atlanta



Luggage Compartment

Ventilators and
Heating Apparatus

Wireless Aerial

Lavatory

Cabin for 11 passengers

Light Luggage
Compartment

Wireless Operator

Forward Mail, Luggage
and Freight Compartments

4 Air-cooled Engines each
of 340 h.p. equipped with
superchargers

*F1155
17/2/11*



SLEEPER plane of American Airlines with upper and lower berths arranged like those of a Pullman coach.

AROUND
the WORLD
by AIR

F1155

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ENJOYING tea aboard an American Airlines flagship and, below, passengers boarding sleeper for a night journey across a continent. One lap of your journey around the world by air can be made on a luxury liner of this type.



By H. W. MAGEE
PART I

IF you've ever considered making an air trip around the world as a short cut to fame and fortune, you might as well forget it and concentrate on a rocket journey to the moon.

Because there's nothing spectacular today about flying around the world. In fact, it's on the verge of becoming commonplace—like making a motor trip to California or a boat trip to Bermuda. Your friends may be envious, but they

won't hail you as a hero any more just because you've flown around the world.

Anyone with the price—and the necessary passports—can girdle the globe by air now. And if you're in a big hurry, you can do it in about three weeks, or even a bit less if you happen to be lucky in making connections. And the cost? Well, roughly, it's about \$3,000—not much when you consider that only a few years ago the fare to cross the Atlantic on the "Graf Zeppelin" was \$2,250. At present you can cross on the "Hindenburg" for \$400.

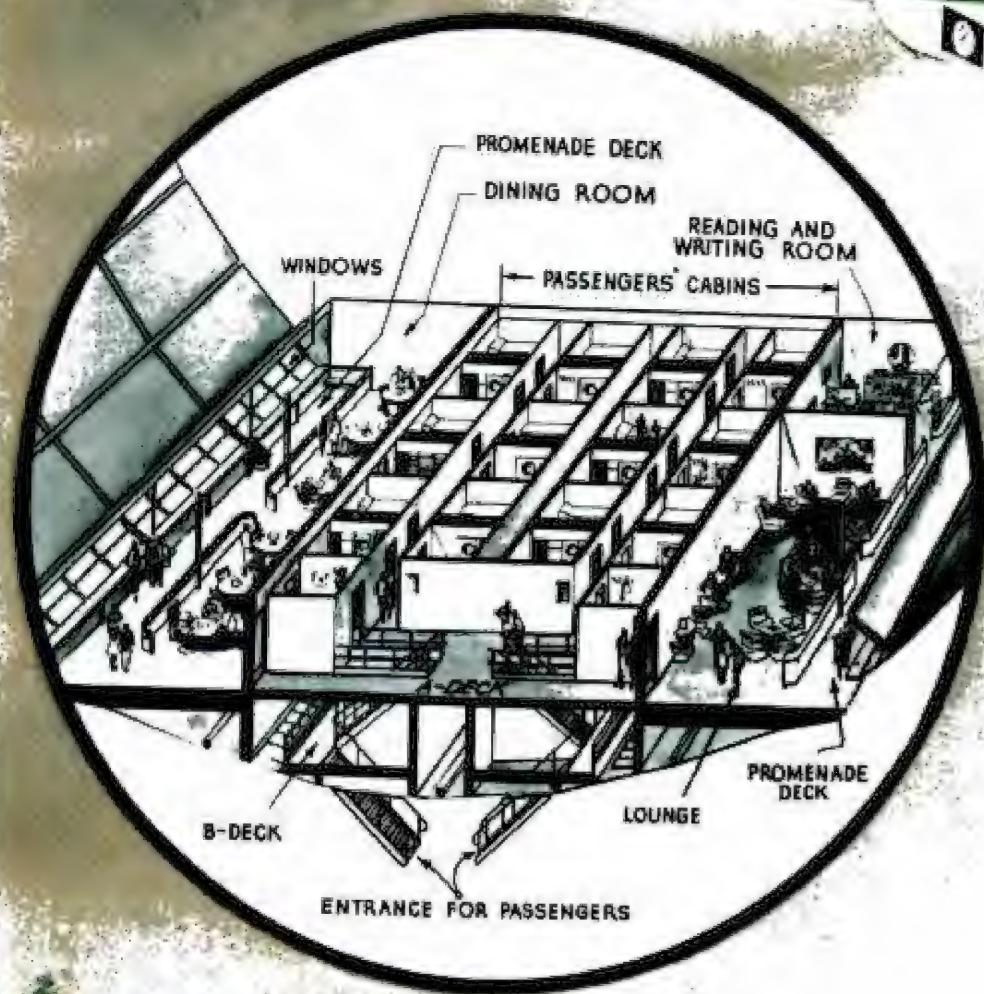
Ever since Columbus proved the earth is round, circumnavigation of the globe

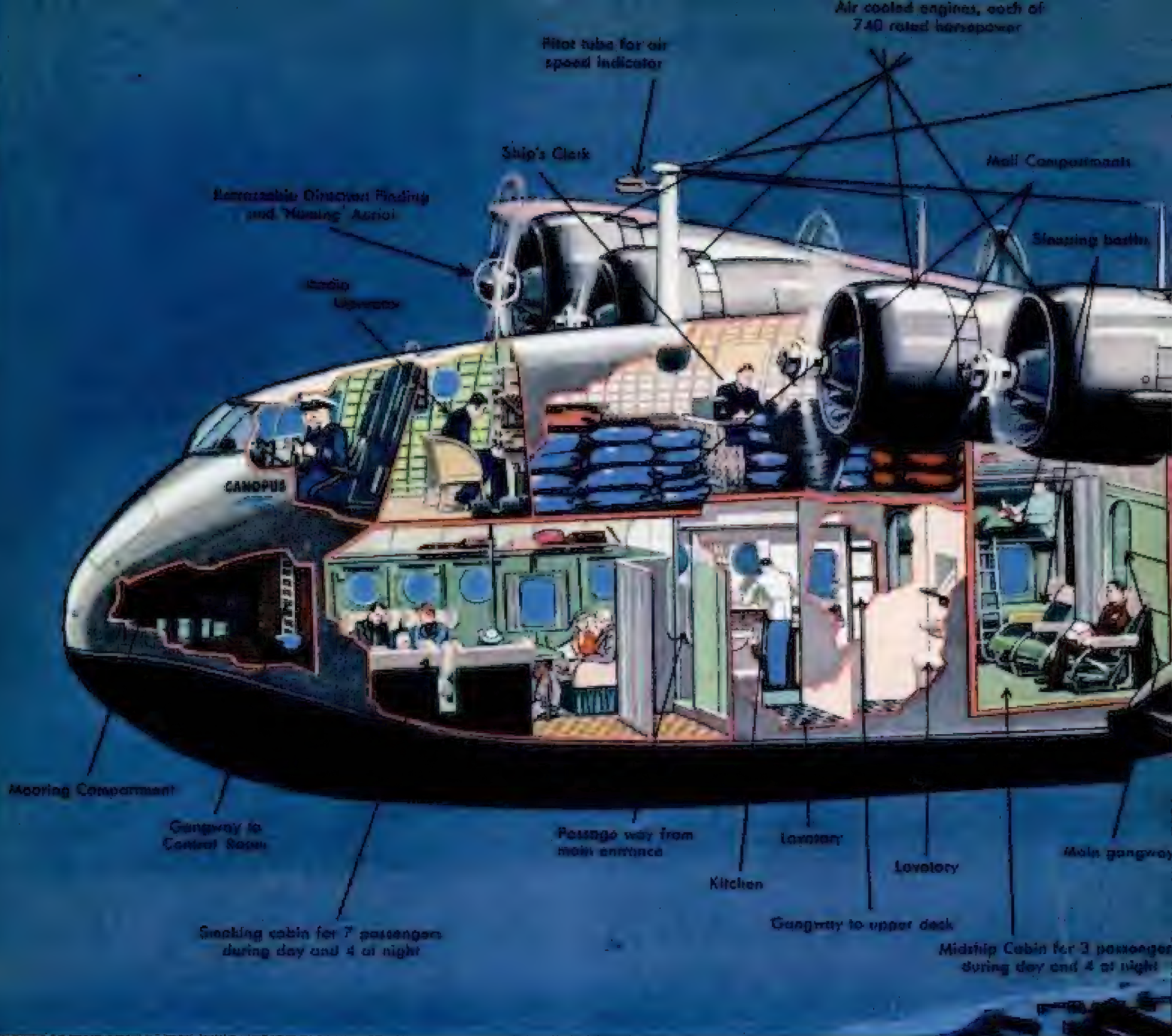
James Montagnes 517 Harbour
P. ... Golda ... 2 and



Photos courtesy Deutsche Zeppelin Reederel

ACROSS the Atlantic, you travel on the "Hindenburg," the world's largest Zeppelin. Above is the radio room of this giant dirigible and at the right, above, is the writing room. The diagram below shows the layout of the passenger quarters and the public rooms on the "Hindenburg."





FLYING boat of Imperial Airways, above, with accommodations for twenty-four passengers by day and sixteen at night. It weighs eighteen tons. On opposite page is a smaller type of Imperial Airways plane.

has been a challenge and a goal for adventurous man. Magellan's little flagship, "Trinidad," accomplished it first in 1522. It took 1,083 days—three years. In 1580 Sir Francis Drake started the business of breaking records. He cut a month from the "Trinidad's" time.

Since then, with a steadily increasing tempo through the centuries, globe-girdlers have been chopping years, months and finally, weeks, days and hours from the time. In 1874 Jules Verne wrote "Around the World in Eighty Days." People laughed and called it a fantastic dream. Fifteen years later Nellie Bly electrified the world by actually beating

Verne's "dream time" with her seventy-two-day journey by rail and boat. Fourteen years after that, John Mears made it in thirty-five days.

Then came the airplane to speed travel in a new element and the globe-girdlers really started to get dizzy. In 1926 Edward S. Evans and Linton Wells, using airplanes, boats, trains and automobiles, got around and home again in twenty-eight days. A couple of years later Mears and C. B. D. Collyer cut the time to less than twenty-four days.

And then, in 1931, Wiley Post and Harold Gatty climaxed all these feats with their brilliant flight around the

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SLEEPER plane of American Airlines with upper and lower berths arranged like those of a Pullman coach.

AROUND
the WORLD
by AIR

F1155

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SERVING early morning tea on one of the 200-mile-an-hour Empire seaplanes. Above, promenade saloon with reclining chairs on one of the new Empire seaplanes. These flying boats carry a crew of five, are eighty-eight feet long and have a wing span of 114 feet.

1945
F1155
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*Patented by
Imperial Airways*

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Painting Gives Preview of Golden Gate Fair



This is how one artist expects the San Francisco fair to look when it is completed. Note the causeway which will connect the exposition island with the new San Francisco-Oakland bridge

How the Golden Gate International Exposition will appear at San Francisco, Calif., in 1939, is shown by a painting from the brush of a Berkeley artist. In the foreground of the painting is the 110-foot causeway which will connect the island on which the fair will be built and the recently completed San Francisco-Oakland bay bridge. At the right is Exposition

harbor. The first building at the right of the roadway will be the administration building, which will become an air terminal after the fair. Exhibit palaces dot the painting, giving the observer an idea of what the exposition will be. The fair will be constructed upon an island now being created by pumping out the shallows of San Francisco bay.

Third Wheel for Auto Trailers Is Mounted in Turntable

Mounted on springs in a steel turntable capable of a 360-degree turn, a third wheel for auto trailers can be attached as a permanent unit to conventional two-wheel trailers or built into the framework of new models. The extra wheel facilitates steering, the triangular frame imparting additional solidity and stability. The third wheel removes all weight of the trailer from the tow car, eliminates the need for balancing trailer furniture and makes hitching and unhitching easy.



Third wheel for auto trailer mounted on springs in a steel turntable removes weight of trailer from tow car

about \$100.00
2380. Howell
11/20/39

Chas. August and Art Newman
3100 Kuesman, Sarag

11/24/36

Water Fans Flush Buildings After Wartime Gas Attack



Fan-shaped sprays of water shooting in all directions disinfect street, air and walls after poison-gas attack upon city

Evolution processes have turned the old-fashioned water wagon into an instrument of defense from wartime gas attacks. Instead of spraying the streets, the tank car in its new guise is equipped with nozzles which throw fan-shaped sprays of water, cleansing the air and purging the walls and roofs of buildings of poison gas. A masked operator rides the tank trailer and manipulates the sprays. The driver rides in an inclosed cab mounted, with the engine, over a single wheel.

Telescope Kept Aimed at Star 1510 by Automatic Guider

Designed to relieve the astronomer of the exacting task of keeping a giant telescope trained on a star during the long hours required to make a photograph, an automatic guider is being tested in Washburn Observatory in Wisconsin. A photoelectric cell does the work. The astronomer picks up a star that is to serve as guide. Its light is divided into two beams by a reflecting knife edge and the two beams are made to shine alternately on

the light-sensitive surface of the photocell. If the star is not perfectly centered, one beam will be brighter than the other, causing a flicker. This flicker, suitably amplified, controls a motor which makes the proper corrections.

Plane Motor Yields One Horsepower per Pound

Ten years of development have resulted in the production of an airplane engine which yields nearly one horsepower per pound. It is rated at 1,205 horsepower and weighs 1,275 pounds. Its builders, who spent \$2,500,000 to develop the engine, call it the most powerful in the United States.



Engine designed for sky liners develops 1,205 horsepower and weighs only 1,275 pounds

Wright Aeronautical
Corp. Paterson, N.J.

Cyclone

Scammell Lorry, Ltd.
Watford West Herts England

U. of Wisconsin

Madison (1)
like the old

Clipper Sights Philippines through the Clouds



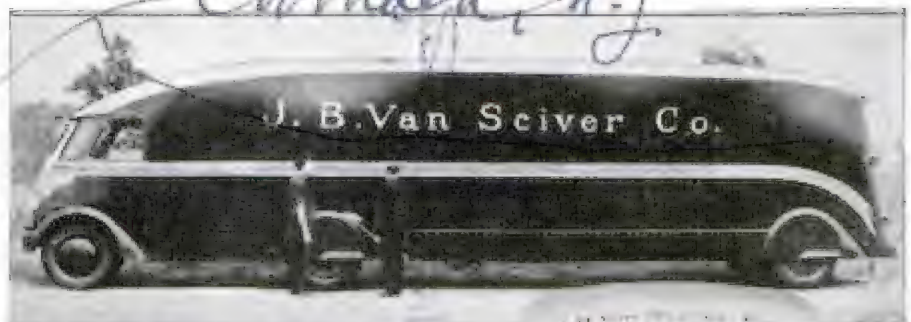
As the "China Clipper" neared harbor in the Philippines at the end of its first westward trans-Pacific flight with passengers, this picture of the islands was taken by a passenger holding Clipper ticket No. 1

Here is the spectacular view that greeted the first passengers to reach the Philippine islands from America on the "China Clipper." The islands lay partly hidden

under a great cloud bank that billowed up as if from some ocean volcano. This photograph was taken by Richard Bradley, holder of Clipper ticket No. 1.

Streamline Van for Furniture Is Trimmed with Gold Leaf

All the furniture for a twelve-room house can be shipped in a huge streamline van built for a New Jersey store. First tractor-trailer of its type ever constructed, it has a steel exterior and is padded inside to protect the furniture. Bands of fourteen-carat gold leaf along the sides, a gold-bronze top finish and gold-leaf radiator trim add to its attractive appearance. The van is of the cab-forward type, weighs eight tons and is thirty-nine feet long.



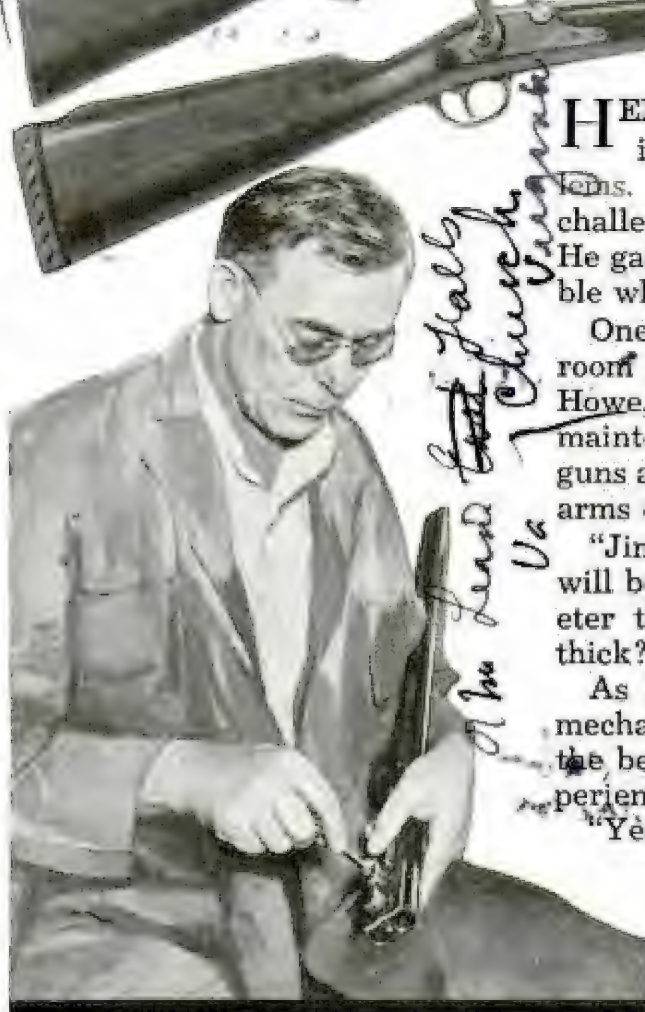
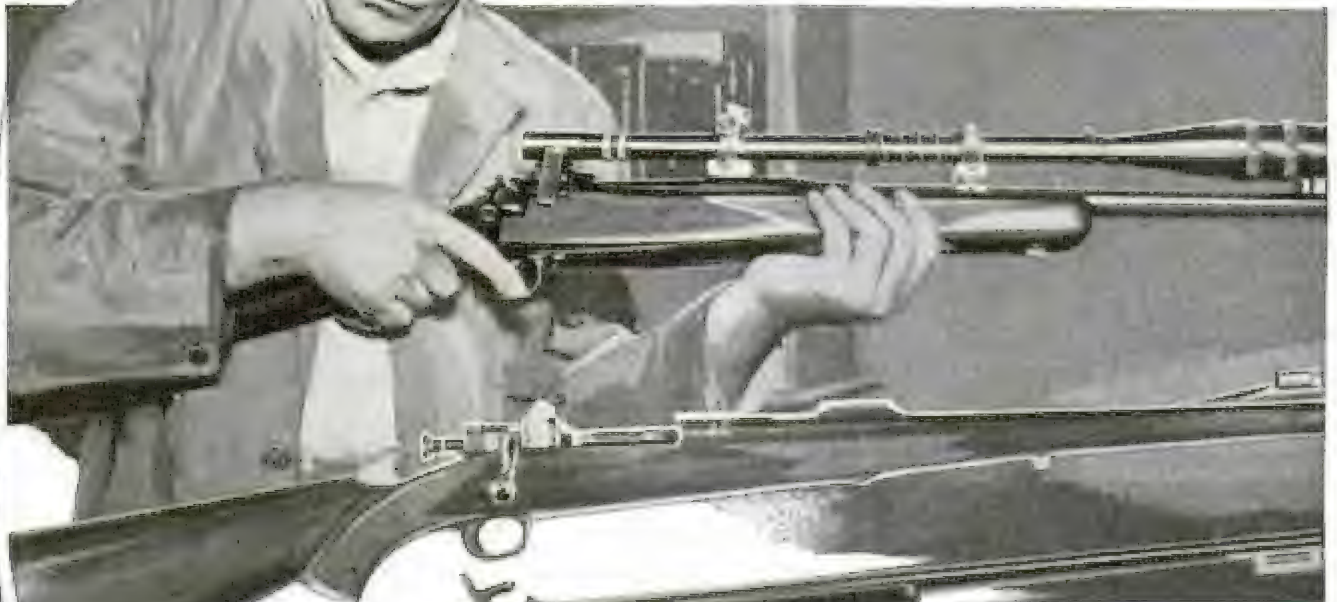
Broadside and head-on views of mammoth tractor-trailer van large enough to carry furniture for a twelve-room house. It is decorated with fourteen-carat gold leaf bands and radiator trim is also gold leaf



Studebaker Corp. South Bend

MASTER GUNSMITH *Seeks*

"Listening in" on trigger action in "tuning up" a rifle. Below, sporting rifle made from Springfield model 1903 army rifle, and muzzle-loader made from 1873 Springfield and barrel of twenty-gauge shotgun. Bottom, Mr. Howe at work



HENRY FORD, a master craftsman himself, is intrigued and fascinated by mechanical problems. Nothing is more enticing to him than the challenge of one of those "can't-be-done" enigmas. He gains great pleasure in demonstrating as possible what most of us would term impossible.

One day Mr. Ford dropped in at the gunsmithery room of his Dearborn Museum where James V. Howe, then in charge of the reconditioning and maintenance of the 1,600 historical rifles and shotguns and the 1,800 pistols and revolvers in the firearms collection, was at work.

"Jim," he inquired, "can you make a drill which will bore a hole one-sixteenth of an inch in diameter through a block of steel thirty-four inches thick?"

As Mr. Howe considered the problem and its mechanical complexity, Mr. Ford announced that the best foremen in his shops, even the most experienced gauge makers, said it was impossible.

"Yes," responded Howe, one of the few remaining masters of gunsmithing, "I think I can do it."

"Get busy, then," admonished his employer.

Knowing from experience that no steel of the quality needed for the drill which

*Letter was returned: 4/27/37
no address.*

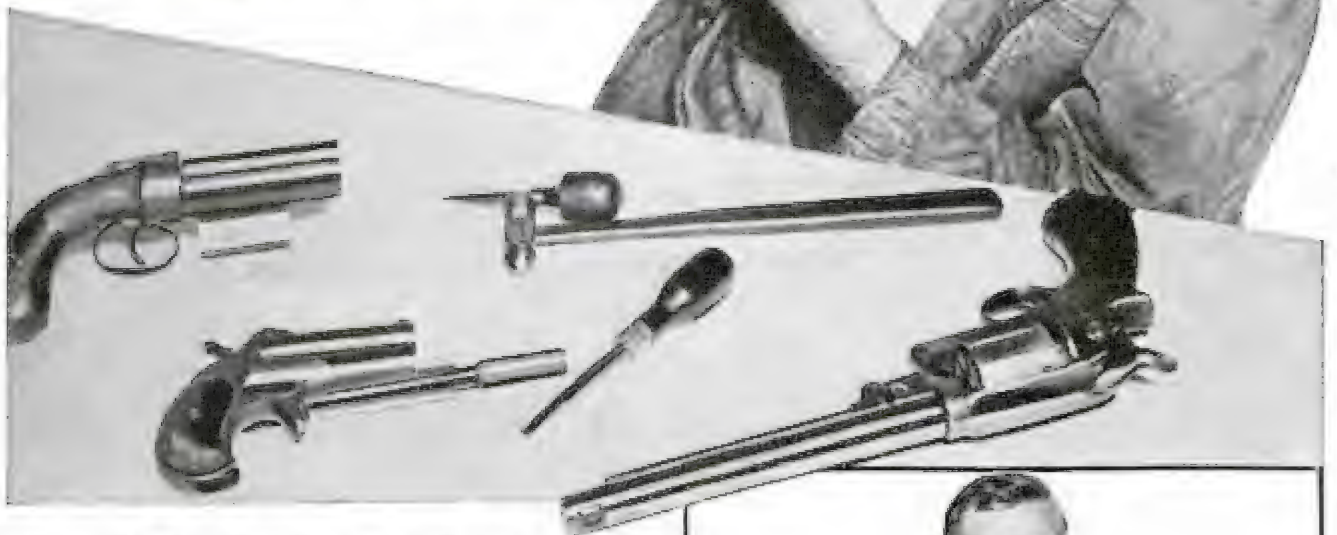
*At the Land Ball Club
Va*

Montgomery Ave
Bellefonte, Pa

World's SMALLEST BORE

he had contracted to make—a feat which would exemplify the wizardry of skilled shop work if successful—was procurable in the United States, Mr. Howe ordered the high-speed steel needed from England. When this high tungsten steel of extreme hardness arrived, the gunsmith started making the almost incredibly small drill, subjecting the metal to temperatures as high as 2,200 degrees Fahrenheit in hardening and yet simultaneously protecting it against blisters.

One-sixteenth of an inch is about equivalent to the diameter of the lead in an ordinary pencil. It was an amaz-



Gunsmith Howe "tuning up" small arms and, at right, testing the results of his work

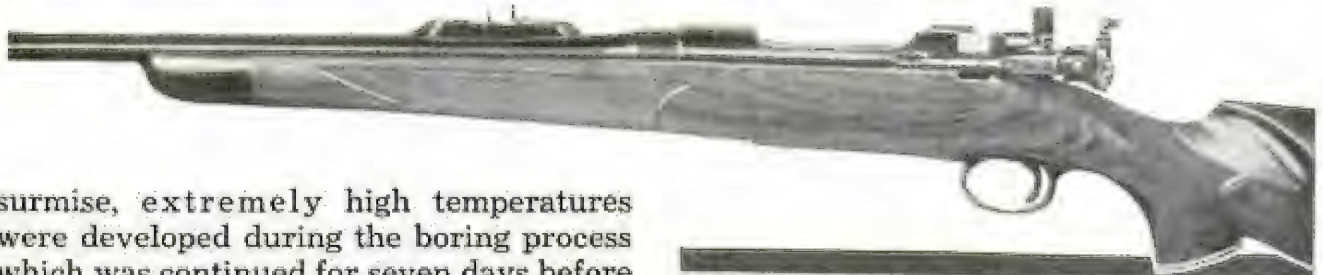
ing accomplishment merely to make a drill of such midget dimensions but to produce one which actually would bore a hole through a solid block of steel almost one yard thick verged on the miraculous. This bore had to be both straight and concentric. Never before in the history of mechanics had such a feat been done. Yet Gunsmith Howe turned the trick, a trick, incidentally, which cost Mr. Ford \$30,000.

The drill as completed was provided with a core aperture through which lard oil was forced to lubricate the drill point during its prolonged drive through the steel block. This aperture also served as the chip groove or channel through which the steel filings and debris were removed by the back flow of the oil. As you may





10,000 feet per second. This is a bullet speed approximately two and one-sixth times faster than the maximum which has been attained up to this time. H. Gerlich, a German, using a gun and bullets of special construction, has demonstrated bullet speeds up to 4,600 feet per second. Those results were calibrated by using special chronographs. The test bullet discharged from the muz-



surmise, extremely high temperatures were developed during the boring process which was continued for seven days before the little drill finally came through the steel. The steel block was mounted on a special framework which rotated 2,400 turns per minute against the tiny drill held in a fixed position.

The story of that \$30,000 hole does not end with the mere accomplishment of the feat. Mr. Ford was satisfied with the performance of the "impossible." In secret, probably, he had the laugh on his experienced gauge makers and shop experts. But to Mr. Howe, the gunsmith, the boring of that diminutive opening through the big steel blank tapped a new field of gunsmithery research. To him, the aperture represented the actual bore of a tiny rifle, a test boring of remarkable experimental possibilities. The demand of the present sportsman is for firearms capable of higher velocities than were possible with the weapons formerly used against big game animals. Greater bullet speed would result from smaller bores and the adaptation of new types of cartridges to these small-diameter bores.

So Mr. Howe, now located near Washington, D. C., where he is continuing his studies of firearms and ballistics in addition to writing technical books and treatises on those subjects, aspires to make a rifle with a bore between one-eighth and one-sixteenth of an inch in diameter. He believes that with such a gun and the development of cartridges suitable for use in it, he could produce bullet velocities of



Top, adjusting telescopic sights on modern rifle. Center, this rifle killed seven lions in Africa. Bottom, repairing small arms

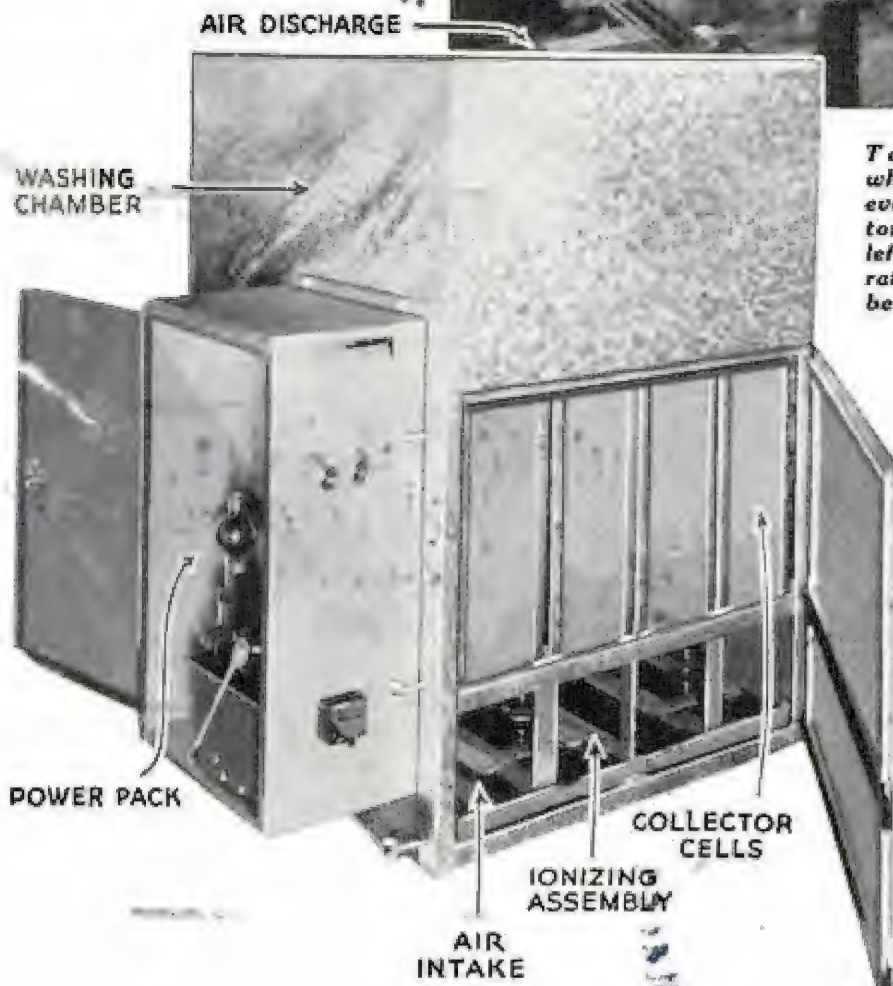
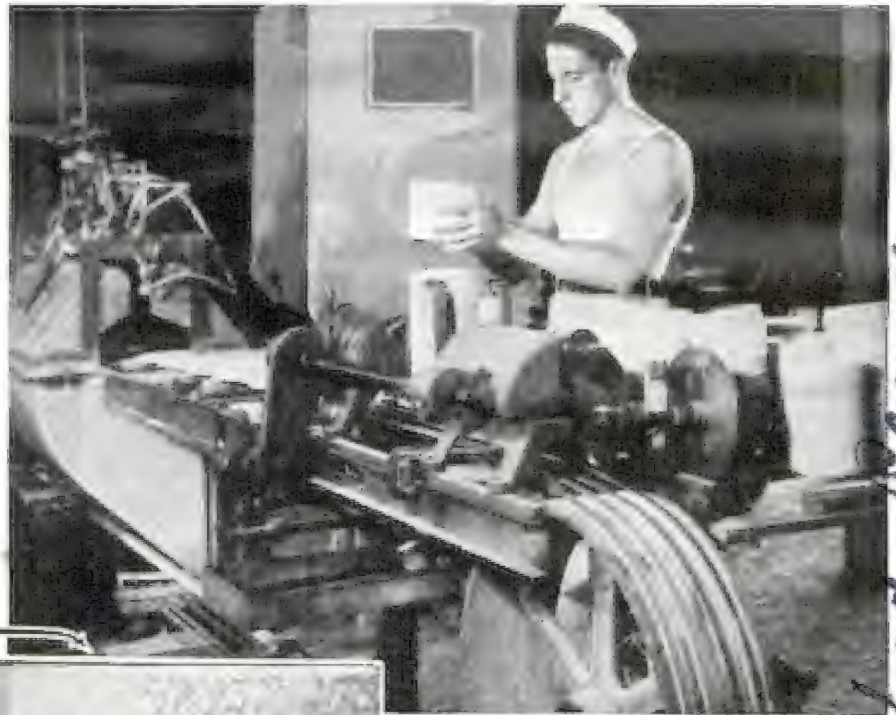
zle of the experimental gun severed a recording wire which in turn struck a plate. The setup was such that the recorders registered the muzzle velocity of the various discharges. Instrumental velocity was a stepping-stone in this research to the final determination of muzzle velocity. Pressure gauges were used to determine the breech pressure produced in the gun by the explosion of the powder charges. Pressures as high as 50,000 pounds per square inch are developed in the breeches of large guns during such firing tests as compared with pressures only one-fourth

(Continued to page 120A)

Falls Church, Va., Sean, Va.
or

Dust Caught in Trap 'Baited' with Electricity

Electricity is the "bait" for a dust trap which is recovering material worth thousands of dollars every week in a china factory and which promises to find wide applications in dust collection both in industry and the home. Wires and screens charged with electricity previously have been used to capture smoke and dust particles, but high voltages made the cost high. In-



Top, china manufacturing plant in which low-voltage electric dust traps every week ionize and recapture four tons of valuable china glaze. At the left is one of the traps. Similar apparatus using little electric current can be set up to purify the air in homes or office buildings

to the grounded plates. The voltages are generated by a vacuum-tube power pack, and each precipitating unit uses only seventy-five watts. As glaze particles collect, they are dropped into a booth and used again in the manufacturing process. Ten collecting units in the plant recapture four tons per week of china glaze worth from six cents to two dollars a pound. Electric traps of this type could be made for homes or industrial

stead, an inventor found a way to ionize the dust itself so that it would cling to dust-trap electrodes carrying a low charge. In a West Virginia chinaware plant, particles of glazing spray are ionized with 15,000 volts direct current and then forced into a collecting cell assembly where they are repelled by 7,500-volt plates and cling

plants to eliminate dust, pollen, bacteria and mold spores inimical to health or manufacturing process.

☐Inquiries as to makers of articles described in Popular Mechanics, will be answered by our Bureau of Information upon receipt of return postage.

Homer Laughlin China Co.

Century-Old Cast-Iron Pipe Found in Good Condition



Officials examining old water main which had been in service for a century

When it was removed recently for installation of a larger main, a section of the 109-year-old iron pipe which has been serving Lynchburg, Va., as a water main was found in good condition. It is believed to be the second oldest cast-iron pipe in America. The pipe has been presented to the city's museum.

Vibrations in Liner Overcome by Propeller Changes

During early voyages of the French liner, "Normandie," in 1935, uncomfortable vibration was found in the aft part of the vessel, especially on the upper deck. How this vibration was overcome was revealed recently in a paper read before the World Power Conference in Washington. Various alterations were attempted during a trial run some months after the maiden voyage. Changing the direction of rotation of the two outside propellers reduced the vibration by twenty per cent, it

was found, but synchronizing the four propellers was of no value and impracticable. Expansion joints in the decks reduced vibration on sun and boat decks by as much as sixty per cent but "brake stanchions" intended to absorb the vibration energy by creating frictional resistance action were of little or no value. Shaft bearings and thrust blocks, which take the end pressure of the propellers, were stiffened up as well as part of the structure around the stern. Four-bladed propellers whose blades had a backward rake of fifteen degrees were used and revolutions were reduced from 200 to 180 per minute at twenty-eight knots. The changes reduced vibration for the vessel as a whole to twenty per cent of its former intensity.

Plane Folds Wings Like a Bird for Storing in Garage

Wings that fold back against the fuselage permit a Los Angeles flyer to store his plane in an ordinary garage. The ship, built by the aviator himself, has a forty-foot wing spread and is twenty-four feet long from motor to tail. A 125-horsepower engine is installed, capable of 10,000-foot altitudes and a speed of 120 miles per hour. There are attachments for pontoons.



With its wings folded back, this small monoplane can be stored conveniently in an ordinary garage.

The Sphere (London)

Giant Bridge over Bay Is Opened to Traffic

Accommodating eleven traffic lanes on its two decks, the giant San Francisco-Oakland bay bridge has been opened to automobile traffic. Its upper deck carries lanes for autos, the lower, three truck lanes and two railway tracks. At Yerba Buena island the traffic passes through a huge double-deck bore to a cantilever span reaching Oakland and Berkeley. The tunnel through the island is seventy-six feet wide, fifty-eight feet high and 540 feet long.

Air view of the San Francisco-Oakland bay bridge as it appeared just before being opened to traffic. Below, night view of tunnel through Yerba Buena island, connecting the San Francisco span with that on the Oakland side. The tunnel is seventy-six feet wide



Television Screen Shows Pilot How to Land Plane in Fog

With television for a fog-piercing eye, the airplane pilot soon may be able to land his ship safely in the thickest weather. Under a plan devised by the Marconi company two radio transmitters at the airport would send signals to two receivers and a

television screen in the pilot's cockpit. An all-direction transmitter on nine-meter wave length would give the name of the airport; wind direction and other information reproduced on the right side of the television screen. The other transmitter on an ultrashort wave of fifty centimeters would send a sharply directional beam swinging through an arc vertically. This transmitter is modulated by tone frequencies varying with

the degree of inclination of the beam. Its signals are reproduced as a pattern of black bars on the left side of the pilot's television screen. The number and arrangement of these bars can be so standardized for given positions that the pilot, watching the pattern as he circles near the airport, can determine the direction and the proper angle of glide for landing.

The Sphere (London) 11/19/31

Cameraman Snaps Steamship Broken in Two



This unusual photo was snapped not long after the waves had pounded this ship against the rocks and broken it in two. Shallow water prevents the stern and bow sections from being submerged

When the "Bessemer City" of New York, an American steamship, went on the rocks off Pendennis Point, Cornwall, not long ago, a photographer snapped a picture shortly after the vessel had broken in two. The photo shows a definite cleavage, bow

and stern portions being separated by several feet of open water. The ship's radio went dead when the "Bessemer City" struck the rocks, but the crew of thirty-three persons was rescued when a farmer living near by called the St. Ives lifeboat.

Roof Acts as Shock Absorber Against Rock Falls at Dam

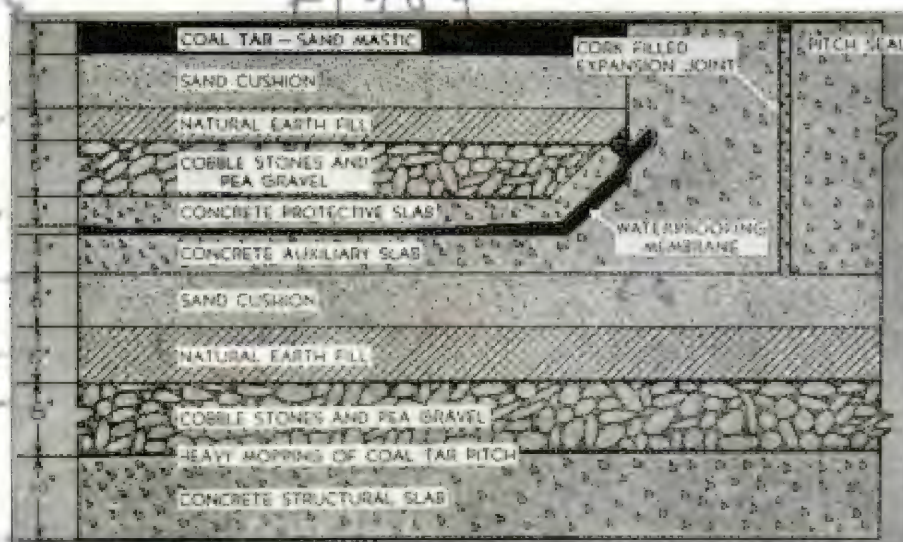


Diagram shows the two to ten-inch layers which form a four and one-half foot shock-absorbing roof protecting Boulder Dam's powerhouse

Eight million dollars worth of machinery are housed in the power plant situated in a perilous spot at the foot of Boulder Dam. A fall of rock from the canyon walls might crush the power plant. But foresighted engineers have protected the costly machinery by building over it a shock-absorbing roof four and one-half feet thick, composed of layers of concrete slab, cobblestones and gravel, natural earth and sand

Architectural Forum

11/12/36

cushions, interspersed with waterproof layers. The roof, 180,000 square feet in area, can withstand a terrific blow from rock tumbling from the canyon rims.

F1509

Heart Is Found More Efficient Than Gas or Steam Engine

In fuel economy, the Mammalian heart has been found twice as efficient as modern steam or gasoline engines. A healthy heart can convert twenty per cent of the energy latent in its food supply into useful work. The fuel efficiency of the best steam engine is about ten to eleven per cent. A good gasoline engine has a theoretical efficiency of twenty per cent, but under usual working conditions, its actual output drops to about half that. The high mechanical efficiency of the heart is pointed out by Prof. Maurice B. Visscher of the University of Minnesota, who has isolated living hearts of laboratory animals in such a way that he could measure the oxygen going in and the carbon dioxide going out.

Minneapolis

New Insulating Sheathing Solves Air-Conditioning Problem

Designed to solve one problem encountered in air conditioning, new insulating sheathing resists moisture and reduces damage to walls. Air conditioning introduces additional moisture into the home or other building so equipped, a condition against which the product is protected by a coating of asphalt on both sides and on the edges. In addition, one side is specially treated to give even greater protection.



Insulating sheathing being applied to house in process of construction. It absorbs excess moisture and prevents wall damage

The Celotex Corp.

Crystal-Like Plastic Glass Can Be Molded



Looking into a crystal that is not glass but plastic, a light, strong material that is nonshatterable

Glass that is not glass, yet clear as crystal, lightweight yet sturdy and non-shatterable and easily molded, is being introduced to American industry. It is a plastic known to the chemist as methyl methacrylate polymer, so transparent that you can see through several inches of it without distortion. Softer than glass and only half as heavy, it is flexible and in liquid form can be poured into molds and hardened, or used to impregnate wood, paper, stone and fabrics to render them resistant to water and chemicals. Dropped on the floor, it will bounce without damage, and will resist a tension of four to five and one-half tons per square inch. Ultraviolet rays pass through this plastic with little resistance, and sunlight does not affect it. Pigments can be worked in to give it color. It can be drilled, cut, sawed or polished.

furnished in

Plastics Div. I am going to buy some of this material

NOISE FIGHTERS

modern community, people are willing to pay handsomely for its benefits. In more ways than one, silence is golden. When you work in quiet surroundings you safeguard your health and temper and you can maintain top efficiency for a greater number of hours of the working day. This increases your earnings.

Any undesired sound is noise. And noise is a pain, a menace, and an annoyance. The noise-conditioned home may be the next great development in modern living. In it you will enjoy the quiet of the country in the middle of the city; you will not be bothered by your neighbor's radio, his piano practice, or his midnight parties.

Another likely development in noise abatement is the sound-conditioning of trans-

THE demand for quiet in homes, offices, transportation vehicles and the great outdoors has given rank to a new profession—the noise fighter.

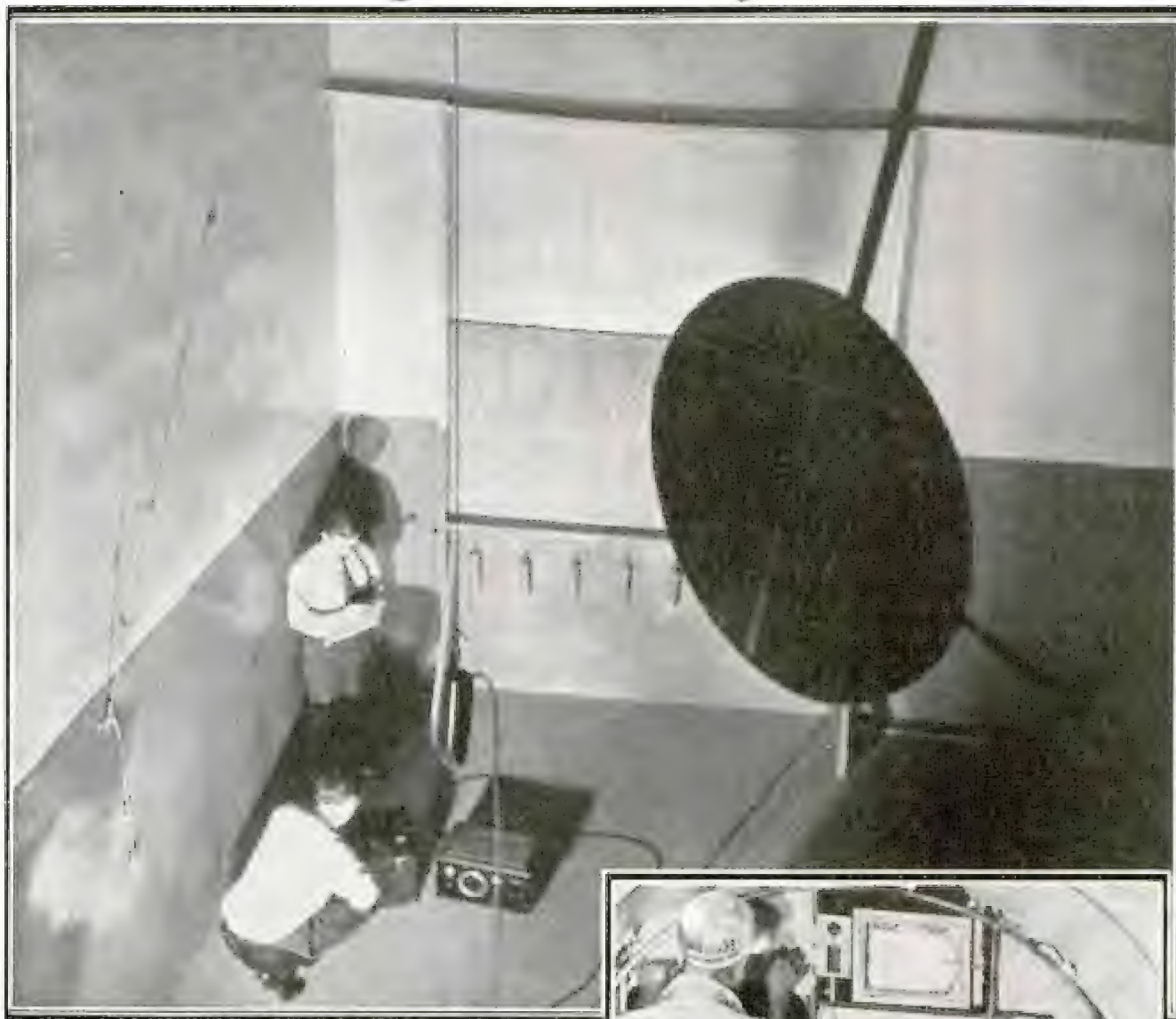
Noise fighters study sound and its unique properties, investigate the effects of noise on human efficiency and endurance, devise methods for deadening sound, test sound-insulating materials and conduct a vast experimental program in the new field of "sound conditioning."

The possibility of creating quiet in homes, workshops and transports presents a golden opportunity to industry because if quiet can be created and maintained amid all the noise-making devices in a



Top, measuring vibrations of steel panels under impact of the swinging ball which acts as pendulum. Below, installing noiseproof panels in office

Battle for QUIET



Soundproofing airplane cabin and, above, reverberation chamber for measuring sound absorption with scientific precision

ports. Trains, airplanes, subways, ships and private cars cause much unnecessary fatigue through noise and vibration. The protection of passengers against noise is one of the chief considerations of airplane and train builders. Tremendous improvements have been made, especially in modern airplane cabins, where it is now possible to carry on a conversation without raising the voice, irrespective of whether ventilators are open or closed.

The technique of noise fighters has improved tremendously in the last few years. For instance, in the measurement of noise absorption in a bare room, the old method at the Johns-Manville Research Laboratory was like this: The noise fighter tiptoed into a bare room and closed the door behind him softly. Then he waited a few



minutes until the air was absolutely dead. Raising an organ pipe to his lips, he blew a note, at the same instant pressing his thumb on a stop watch. Straining his ears to catch the last dying sound, he pressed his finger on the stop watch the moment his ears could no longer detect it. After averaging the results of similar tests with different sound frequencies, he arrived at his conclusions.

The modern technique for obtaining the same information eliminates every possibility of error. The operation takes place in a bare room, but nobody is present. Instead of a man, there is a pendulum swinging from the ceiling. Instead of a crude organ pipe, there is a dynamic speaker mounted on the pendulum. The man's lungs are supplanted by a vacuum-tube oscillator which actuates the loudspeaker to give off an accurately controlled "warble tone"—an eerie sound similar to



Top, noiseproof wall withstands fire for an hour. Center, taking outside temperature of wall. Below, soundproofing an airplane cabin

the haunting note of a hoot owl in a lonely countryside.

Instead of using his ear, the noise fighter employs a dynamic microphone, far more sensitive. It, too, is mounted on the swinging pendulum. Wires, corresponding to a man's nervous system, lead from the microphone to an adjoining room where they connect with relays, corresponding to a man's brain, and with an electromagnet, which corresponds to a man's thumb on the button of a stop watch. This indicates how the modern noise fighter goes about his business. Nothing is haphazard or left to chance; he eliminates the factor of human error wherever possible.

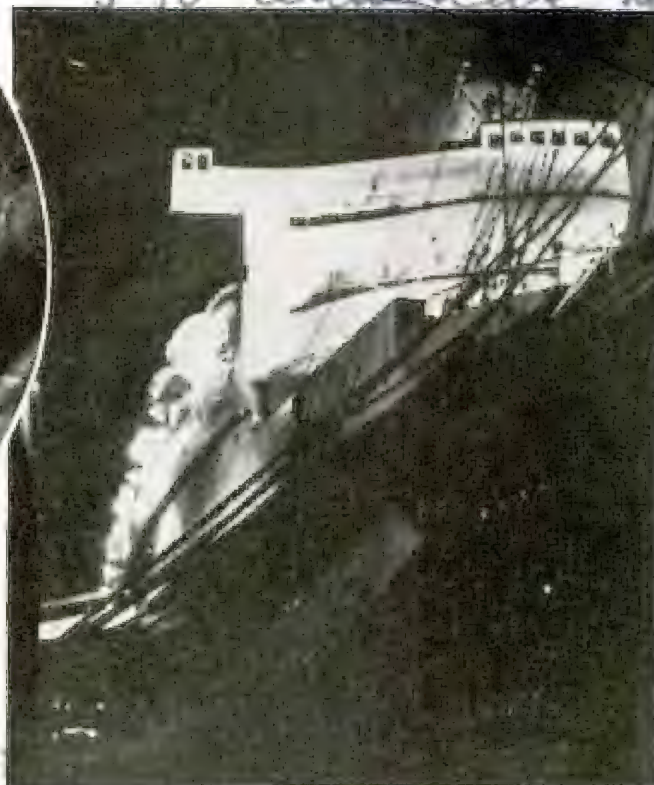
The reverberation chamber, described above, is but one of a number within a "fortress" where the noise fighter carries on his experiments. It is literally a room within a room and

(Continued to page 144A)

Night Picture Hunt Latest Idea for Parties



Circle, prize photo, tired feet of a horse. Right, another outstanding picture, night view of the "Queen Mary" at dock



Introduced recently at a society function, the night picture hunt is a new idea for the hostess who desires to deviate from the conventional party. The hunt is organized as a contest, with guests formed into teams and equipped with cameras and photo flashlamps. Each team is given instructions to search for the most interesting subjects to be photographed at night and is supplied with a list of clues or suggestions for pictures. Typical suggestions include "a man sleeping in the doorway of a tenement house," "an actress making up in her dressing room," "a scene in a newspaper office," "the traffic officer on night duty," and so on. In the original hunt, three hours were allowed for the picture quest. Then the guests returned to have their pictures developed and judged for prizes. Several excellent photographs were submitted, though all the contestants were amateurs with the camera.

Vanilla Made from Wood Pulp

Vanilla flavor is to be extracted from wood in a plant at Cornwall, Ontario. Vanillin is obtained naturally from vanilla beans and made synthetically from coal tar, and is used in perfumes and flavoring. The Canadian plant will manufacture it from sulphite liquor, one of the by-products of the paper industry.

Raised Letters Made of Wax Written with Electric Pen

Depositing letters of colored plastic wax, an electric pen writes raised characters on any surface. The wax is melted on contact with an electrically heated element and is emitted from the feed point upon the card or other surface where it hardens almost



Electric pen set which writes raised characters of colored wax on any smooth surface

immediately, leaving an elevated letter which does not chip, fade or break loose. By regulating the heat, the width and size of the lettering can be controlled.

570 Lexington Ave. New York
 Advertising Plastics Co.
 480 Lexington Ave. New York

F1532.

F1444.

Logotype

Sound Films of Auto Races Are Shown inside Hoods



Reminiscent of the "penny arcade" are these stalls in which sound pictures of auto races are shown

Individual movie shows attracted many interested spectators who visited the annual automobile show at London. Sound films of automobile races were seen and heard inside hoods. Several of these booths were installed.

Homes Assembled Like Autos Would Cost Two-Thirds Less

Mass production and prefabrication of homes may lower housing costs to about one-third the present prices so that any family can own its own dwelling. This is the view of Harvey Wiley Corbett, eminent New York architect, who believes some of the methods used in assembling automobiles might well be applied to building homes. "The cost of assembling a Ford," he says, "is only one per cent of its price, but the assembling cost of a house is all of sixty per cent. In order to reduce the cost, the item of assembly will have to be eliminated. This means the end of

brick, plaster, lumber, shingles, nails and all sorts of attachments. The mass production house will not be possible until its units can be manufactured complete in a factory, including all wiring, switching, plumbing and service items, such as stoves, sinks, lighting, curtains and doorbells. The cellar will have to go, and the foundation too, for there is no reason why a house should not rest on the ground instead of in it. Such homes need not be uniform, but they must be made of interchangeable parts to be assembled at the choice of the owner. The first such home will probably cost about \$1,000,000, including the machinery for its manufacture, but after that houses should be available for thirty per cent, or at most forty per cent, of their present cost."

\$1492.

Tough Plate Glass Resists Impact of Steel Ball

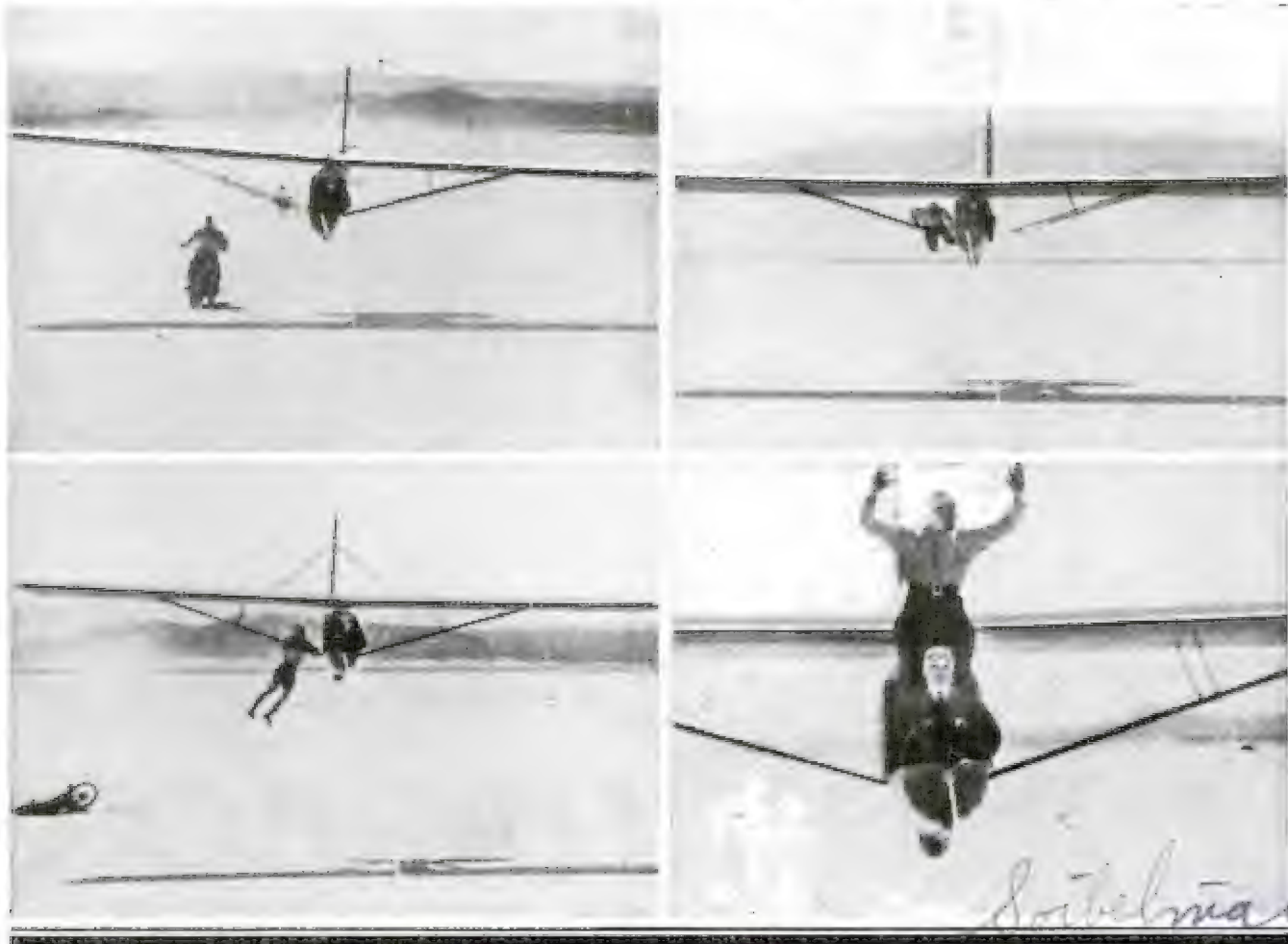
So strong and tough that a steel ball weighing one-half pound can be dropped from ten feet without injuring it, a new plate glass is being tested by the national bureau of standards. It has been designed for use in gymnasiums, armories and similar buildings. The new glass does not obstruct passage of light and requires little attention from cleaners.



© Harris & Ewing

Steel ball on glass plate after being dropped from holder suspended in frame

From Motorcycle to Glider at Mile a Minute



Top, left, motorcycle and glider attain same speed. Bottom, a moment after rider transfers to glider. Top, right, climbing up on the glider. Bottom, safe aboard the glider, and the stunt's a success

While speeding sixty miles an hour, a daring motorcycle rider transfers to a glider in the latest death-defying stunt. The glider pilot keeps his plane on an even keel while the motorcyclist rides along beneath. At the moment when

speeds of glider and motorcycle are the same, the motorcyclist releases the handlebars and grabs the glider. Cautiously he pulls himself up until he reaches a safe position behind the pilot. Meanwhile the riderless motorcycle falls to the ground.

Twist of the Wrist Forms a Cookie in Full-Recipe Press

Cookies thick or thin, plain or fancy, are turned out in fast time by a full-recipe aluminum cookie press just introduced. It makes sixty cookies with one filling; a simple twist of the wrist forms a perfect cookie. Gauges are supplied for various sizes and thicknesses, and there are twelve different forming plates for fancy shapes.

One of the world's shortest railroads is the Chicago Short Line, operating ten engines, fifty-three freight cars and a caboose on 1.12 miles of track in the steel-mill district.



Making a big batch of cookies with the press. Forming plates for fancy shapes are seen in foreground

Chicago Short Line

Aluminum Sweets Mfg. Co. Main Tower, Chicago



Top, harbor policeman operating machine gun. Below, harbor officer boarding vessel for inspection

HARBOR

PIRATES still live. Not the freebooters of old, but wharf rats, slippery criminals in high-powered boats who slink out at night to plunder the world's richest harbor, the New York docks. And, more often than not, they would succeed except for the efforts of the harbor patrol—a little army of marine policemen entrusted with the task of guarding New York's water front within the three-mile limit.

The harbor patrol selects men with a hankering for boats and water, with iron in their constitution and adventure in their blood. This work demands endurance, courage, seamanship, and not a little detective skill. The wharf rats, freebooters, traders in stolen goods, and pirates with whom the marine division of the police deals operate under cover of the night, resort to homicide if necessary and have no check but the harbor police.

Word has gotten around the water front that the marine cops can take, and they can give. The ideal condition for piracy along the world's richest harbor is a black foggy night and stormy weather—the stormier, the better for the pirates. On

Harbor policeman shouting traffic orders to a freighter. Handling the water traffic along New York's congested water front constitutes part of the work of the harbor patrol



PIRATES *on the RUN*

bright moonlit nights, the pirates do not venture forth and the marine division takes it easy. But when the eerie mists creep over the docks and cut down visibility to a few feet, when rain, sleet, and wind cut loose, the harbor patrol prepares for action.

On a pitch-black night, you cannot see the big sign that marks the South African docks. There is no noise but the gurgle of water around the supporting piles. At 2 a.m. the watchman makes his rounds and finds everything in order. Ten minutes later, he lies in a corner tied to a post and gagged. The pirates work swiftly.

The pirate craft is a long sleek cabin boat with an ample hold. Hardly a word is spoken among the freebooters as they roll 150-pound bales of crude rubber across the dock floor and heave them over. Rubber sells at seventeen cents a pound.



Figure out the possible profit if the pirates make off with fifty bales of this stuff. After the boat is loaded, they cast off and back out of the slip. Not a light on board. The only noise is the muffled motor, purring softly as the craft creeps cautiously into the river, leaving no visible trail.

Soon an alarm goes out over the police teletype and all harbor precincts assign detectives. The clues are slim. The water front stretches for 580 miles, and there are thousands of places where the booty might be landed, or transferred to another vessel. The harbor patrol has its own secret method of tracing the movements of suspicious craft. Often just when the free-



Top to bottom, harbor policemen demonstrating how a lifesaver is tossed to person in water, marine policeman grappling for a body, hurling a tear-gas bomb such as the harbor police use in quelling mutinies and riots on boats in the harbor, and the pilothouse of one of the speedy police launches which guard the water front

booters think they have made a haul and escaped, they fall pell-mell into the hands of the waiting police.

The police launches are low and black-hulled to render them inconspicuous. They have trim lines in the water, and they can travel at a thirty-mile clip. Few pirate vessels can go faster. If speed launches can't overtake a pirate, a well-aimed machine gun will. And there is good reason to dread the aim of harbor patrolmen. About 150 men are necessary to man the fleet of eight launches in the harbor patrol. The work is supervised by one captain, three lieutenants and eight sergeants. Their watch never lets up for one minute in the entire year.

Chasing pirates is but one of the harbor patrol's many duties. Much of the work is not directly concerned with law enforcement. For instance, the harbor patrol aids small boats in distress, grapples for dead bodies, directs traffic during regattas, and performs errands of mercy. The immense harbor frontage and the countless activities thereon leave little time for idleness. On an average of once a day, the harbor patrol picks up a floating body and transfers it to an ambulance. About 400 bodies are picked up in the course of a year, and a large percentage of them are never identified. People jump from bridges, sometimes unnoticed. Others slip from boats and are drowned. Still others are murdered and thrown into the water. When the bodies are picked up a report is filed with the bureau of missing persons. Of about 200 boats a year reported stolen or missing from their stations, about half are recovered.

Recently a harbor patrolman displayed great courage in the face of adversity. One night with a half moon smiling, the tide rip at Little Hell Gate caught the thirty-five-foot cabin cruiser "Nordic" and hurled her upon the treacherous rocks between Randall's island and Ward's island. Little Hell Gate earns its name when the tide rips through the forty-foot channel. Many a small vessel has cracked up on the shallow rocks. When a police launch arrived, the "Nordic" was in a bad way, with her skipper begging for a rescue.

Unable to buck the tide in the police launch, the sergeant sent Patrolman Michael Grecula out in a small rowboat.

A cross-current upset the boat and threw Grecula overboard. Swimming in darkness in that mad tide, Grecula gained inch by inch until he reached a half-submerged rock. And there he clung grimly for three hours until the searching spotlights of half a dozen police launches found him, 400 yards from the spot where he went under. After he was rescued, he refused medical attention, and returned to duty as if nothing out of the ordinary had happened. As for the "Nordic," she was safely towed out with her skipper vowing never to sail near Little Hell Gate again.

Part of the harbor patrolman's education consists in learning the geography of the harbor. Although it may not appear larger than a pinhead on the map, the busiest harbor in the world has a shore line that winds in and out for 580 linear miles, cut up by rivers, bays, canals, inlets, and miniature harbors. Dutch Hills creek, Buttermilk channel, Princess island, Kill Van Kull, and the Narrows are definite localities which the harbor cops must know as you know the streets around your home.

In winter, the hazards and dangers besetting the patrol are multiplied. The river ice moves into the bay with the tide and buffets the police boats about mercilessly. Large steel-hulled ice-breakers can buck the river, but the small wood-hulled launches must proceed cautiously. From outlying sections come distress calls telling of small craft caught in the ice pack, of boys floating out to sea on floes, and of barges cast adrift. Recently patrolmen on board the police boat "Sinco" risked their lives to rescue a dog whose legs were frozen to a cake of ice drifting out to sea.

Harbor collisions between large ships often involve loss of life and property. An excursion steamer's boilers exploded in the East river and scattered people helter-skelter. The harbor patrol boats rushed to the scene and fished more than forty persons out of the cold water within an hour.

During prohibition days the harbor patrol led many a stiff chase after the speedy rum runners. The exploits of one police

(Continued to page 138A)



Top, hand signaling from a police boat. Each harbor policeman must know how to send and receive such messages. Center, every harbor policeman is a good shot with pistol, rifle and machine gun. Here two policemen are practicing from the deck of a pitching police launch. Bottom, the helmsman of a police boat in New York harbor

Latest U. S. Mint Built on Rock to Resist Fire, Quake and Theft



Latest view of mint, showing approach from street level. The foundation is rock. Note resemblance to a fortress

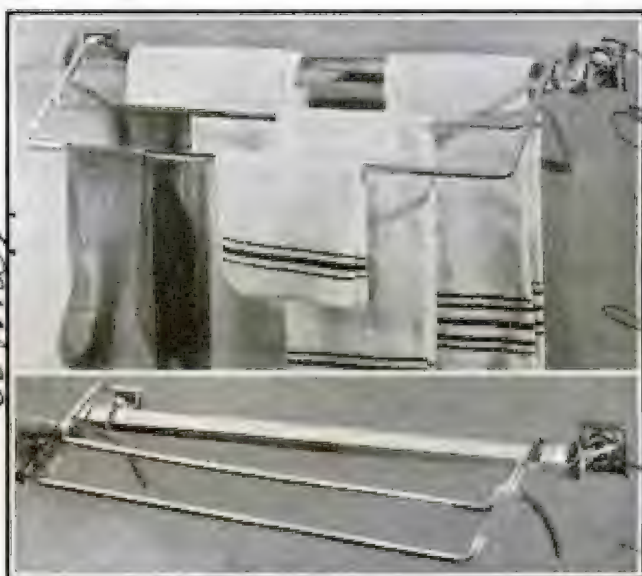
Rising from foundations deep in solid rock, surrounded by steep cliffs and built 100 feet above the pavement at the entrance, the new San Francisco mint is designed to resist fire, earthquakes and attempts at robbery. It is more impregnable than many fortresses and contains two alarm systems, a watchmen's report system and a radio communication system. Should thieves tamper with the regular lighting equipment, a self-starting power generator automatically would begin operating to frustrate attempts to darken the building. A gun tower covers all approaches and the whole place can be flooded with tear gas almost instantly through a network of pipes. The front and rear entrances both have two electrically controlled steel doors, only one of which can be opened at a time. Defense lights will illuminate the outer walls at night. Safety for the government's gold and silver is provided by the storage, melting and refining vaults with reinforced concrete walls two feet thick. The mint is five stories high. The first floor has a marble lobby, large storage and melting vaults, vaults for nickel and copper, a carpenter shop, plumbing shop, blacksmith shop,

boiler room, emergency generator room and locker rooms. On the second and third floors are offices, minting rooms, assay laboratory, and women's lunch room. The fourth floor will house a system which will recover metallic particles from the vapor given off by the furnaces. This equipment consists of a series of tubes in which the air is electrified with 75,000-volt current. As the discharged vapors pass through the tubes, the electricity will ionize the metallic particles, causing them to cling to the sides of the tubes. A pistol range for guards and machinery to operate elevators occupy the fifth floor

F137

Towel-Rack Capacity Tripled by Attachable Bar

For extra space on which to hang guest towels or laundered clothing, an attachable bar which fits over the present towel rack is available. It adds two full lengths to the rack. The installation calls for no drilling of holes, the bar simply gripping the rack firmly.



Top, rack in place. Bottom, how it is attached to conventional towel bar

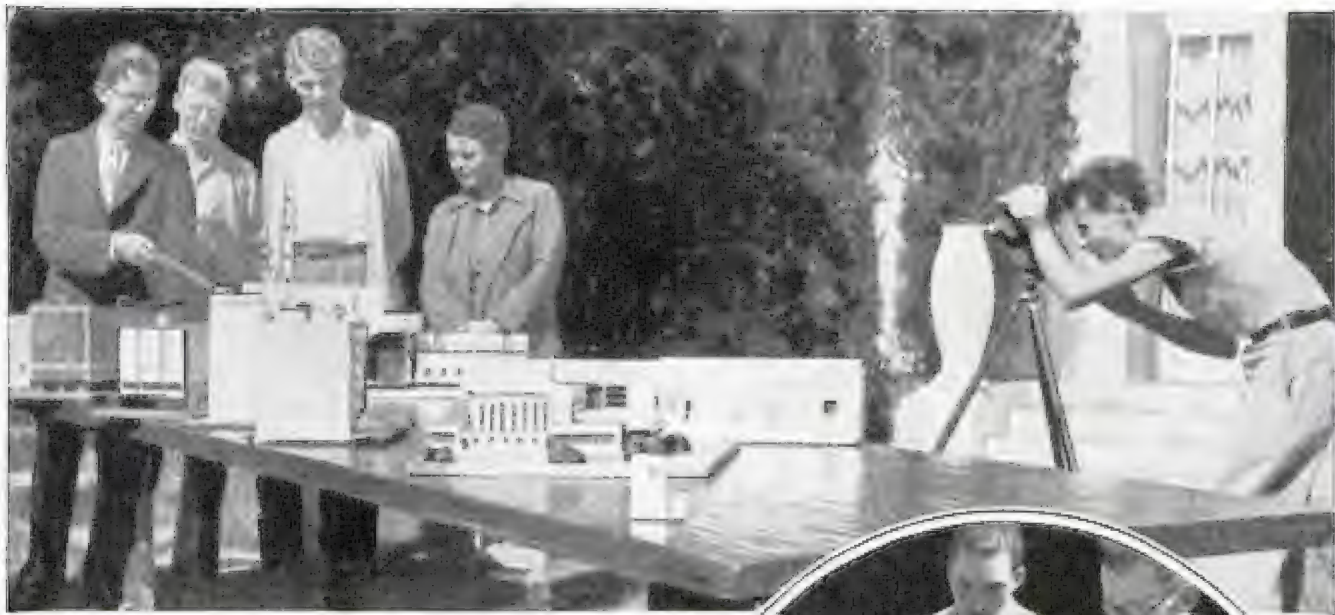
Doegger, Inc.
5.32

cont. M.A. Willson 210 Spencer
San Francisco, Calif.

Ames

Wellman

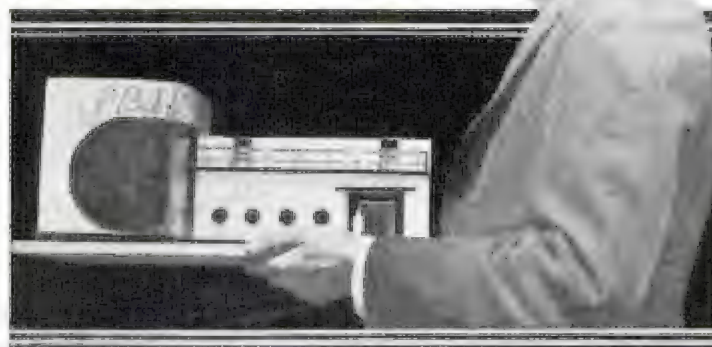
Architects Test Model Buildings with Movies



Architectural students, above, are grouping model buildings to be filmed with amateur movie camera



Above, focusing camera on model for a closeup. When this is projected on the movie screen it creates the illusion of a full-size building



At the left is a scale model of a modern shop, and above, designers are finishing another store model to be filmed for study of perspectives

Architects and students of building design are using the motion-picture camera to translate scale models into seeming reality. From their blueprints they build tiny models. Then, from every angle of approach and under varied lighting arrangements they film the models with amateur movie cameras. Projected upon a screen, the picture seems to transform

the model into a full-sized house, affording a dramatic test of its architecture and emphasizing both beauty and error of line. Students at the University of Southern California make their lessons in perspective graphic with this use of a camera.

Los Angeles.
Twenty-five billion telephone calls were made in the United States last year.

Blod
546 1/2
Cml. Maxwell
546 1/2
500 copies.

Monthly

War Tanks Conquer All Obstacles in Tests



Top, army tank going over the top in test of hill climbing. Bottom, smashing through wooden building during maneuvers

Climbing over or smashing through obstacles of the kind which might be encountered in actual warfare, army tanks demonstrated their effectiveness in the recent Austrian maneuvers at Bruck. One of the tanks, after climbing at high speed over an obstacle, hurtled into the air and landed several feet beyond, yet continued on its way after crashing to the earth. Another battered through a wooden structure, sending boards flying in all directions. Under conditions of modern warfare, these high-speed "fortresses" might be expected to smash through barb-wire entanglements, leap narrow trenches and perform innumerable other duties as their crews man guns from the interior.

Shovel-Nosed Wheelbarrow Speeds Loading and Hauling

So constructed that it serves as a shovel and a wheelbarrow, a new means of manual transportation speeds up loading and hauling. To fill the shovel-barrow, the op-

erator digs its shovel nose into the pile of sand or dirt. Downward pressure on a treadle throws the load into the body, then a second thrust of the shovel loads the barrow and it is wheeled away. Pressing a foot lever tips the body to discharge the load. Packages, castings, forgings, bolts, kegs and many other items may be transported easily by this means. The shovel-barrow also is handy for the home, since it handles any loose materials, gravel, sand, coal and ashes, as well as being adapted to shoveling and hauling away snow from paths and roads.



Workman loading the shovel-nosed wheelbarrow

Riddle of Cellulose Is Solved by Woman Scientist

Radical changes in the textile and laundering industries may result from the discovery of a woman scientist, Dr. Wanda

Chicago Sub. 11/6/36

K. Farr that most of the artificial fibers and dyes believed to have come from cellulose are actually derived from a cement-like coating over the cellulose. This coating has been partly identified as pectin, the substance which makes fruit juices jell. Cellulose is used for structural material in cotton, flax, rayon, newsprint and paper industries. Dr. Farr found that it can be separated into the cement and a white powder which is the real cellulose and which does not respond to the chemical treatments in making rayon. It is the cement, containing pectin, which reacts to the chemical treatment.

F1396

Sick Dogs and Cats Ride Motorcycle Ambulance

Consisting of one large and one small cage mounted on the sidecar chassis of a motorcycle, a dog and cat ambulance carries stray and sick animals to the shelter of a Maryland unit of the Humane Society. The equipment is the very latest for transportation of animal patients.

Baltimore



Dog rides in big cage, cat in small one

Crew Saved from Submarine by Wearing Automatic Lung



Crew emerging from wrecked submarine, wearing automatic lungs which permit regular breathing. Diagram of apparatus shown in inset

To aid in the rescue of men from wrecked submarines, an automatic lung has been developed in Germany. It has its individual oxygen supply which is fed through a mouth tube. Tight goggles protect the eyes and a nose clip prevents inhaling water. Respiration goes on with its normal, uniform rhythm, the apparatus furnishing just as much air as is desired without superfluous pressure or any danger to the human lungs. Enough air is carried to permit two hours' work under water or in a gas-filled room.

Cmdr. Hays J. Kutschba

Electric Oven for Flowers Makes Beauty Last



Thousands of "everlasting" flowers mounted on wire stems are hung heads downward in ovens to dry

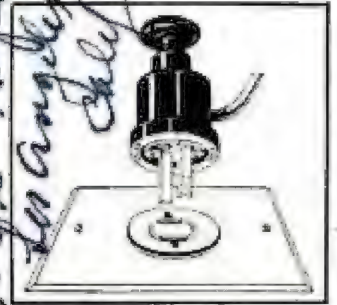
Twenty million flowers were given a "permanent" beauty treatment last year. Harvested from seventy acres in California, they were dried—chiefly by electricity—in their natural colors and shipped with synthetic stems to be used for decorations and floral pieces. When this industry was started, not so long ago, the natural stems were left on, but they were brittle when dried and did not last. Now the blossoms are cut without stems and mounted immediately on fine wires, then hung in bunches of twenty-five in dehydration chambers, sometimes as many as 50,000 blossoms in the chamber. They remain from thirty-six to forty-eight hours in temperatures of 130 to 200 degrees, heated by electricity; some have long

strip-heaters on the chamber floor, others blow heat down through the flowers from units on the roof. The so-called "everlasting" straw flowers thus treated will retain their natural beauty for years.

Electric Plug Wedges Itself in Outlet Socket

Equipped with double prongs that act as a wedge, an electric plug now available grips the socket firmly and will not slip out.

After inserting the plug in the outlet, a rubber ram is pressed and the auxiliary prongs slide along the regular contact prongs into the socket, wedging it tight.



Lighted Sign Warns Motorist of Wide Truck Approaching

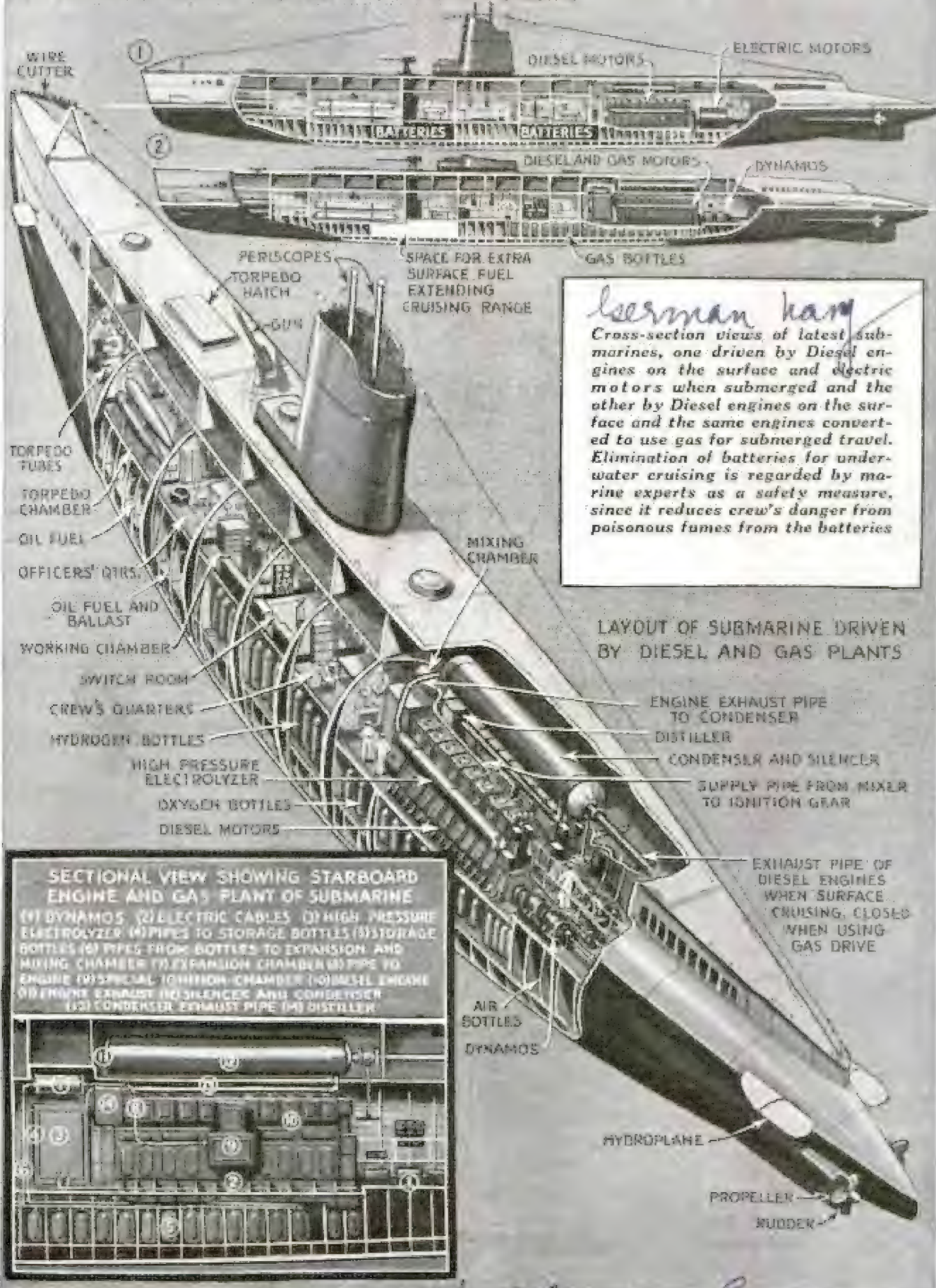
To guard against sideswiping other cars, a trucking concern in Germany equips its freight carriers with a distinctive sign that means: "Wide truck coming!" When motorists see it they keep to their own side of the road. The sign is illuminated at night.



Yellow triangle set in a blue square above windshield gives night and day warning of wide truck

Gas-Driven Submarine Safer under Water

(1) SUBMARINE IN GENERAL USE WITH DIESEL MOTORS FOR SURFACE PROPULSION AND ELECTRIC MOTORS FOR UNDERWATER WORK. (2) SUBMARINE WITH DIESEL MOTORS FOR SURFACE DRIVE AND SAME MOTORS CONVERTED TO USE GAS FOR UNDERWATER CRUISING



Capt. George H. Davis, Esq.
1711 17th St. N.W. Wash. D.C.

F1293 1144 S. Grandville St. Los Angeles, Calif.

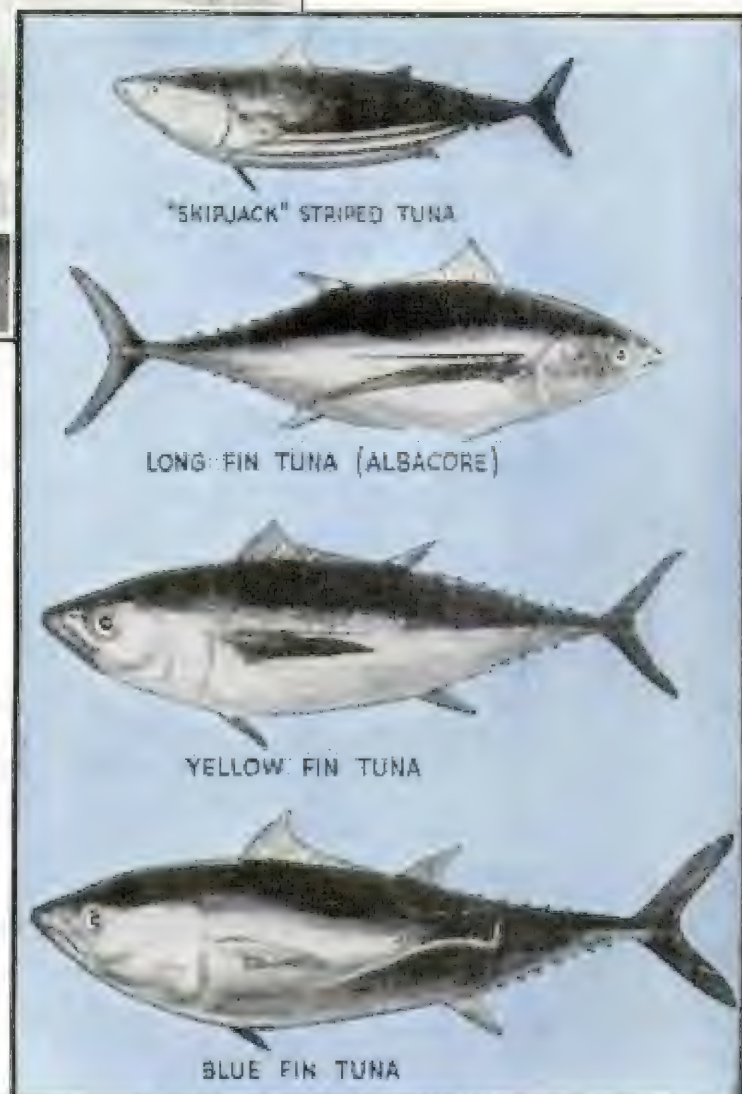
TUNA FLEET Battles



Through his binoculars, the skipper of a tuna boat searches the sea for the flashing fins of tuna. Below, the tuna fisherman must learn to distinguish the four different kinds of tuna at a glance

LOS ANGELES and San Diego harbors are echoing today to the sound of calking mallets and riveting hammers as the southern California fishing industry girds to meet the competition of Japanese commercial tuna craft in western Pacific waters.

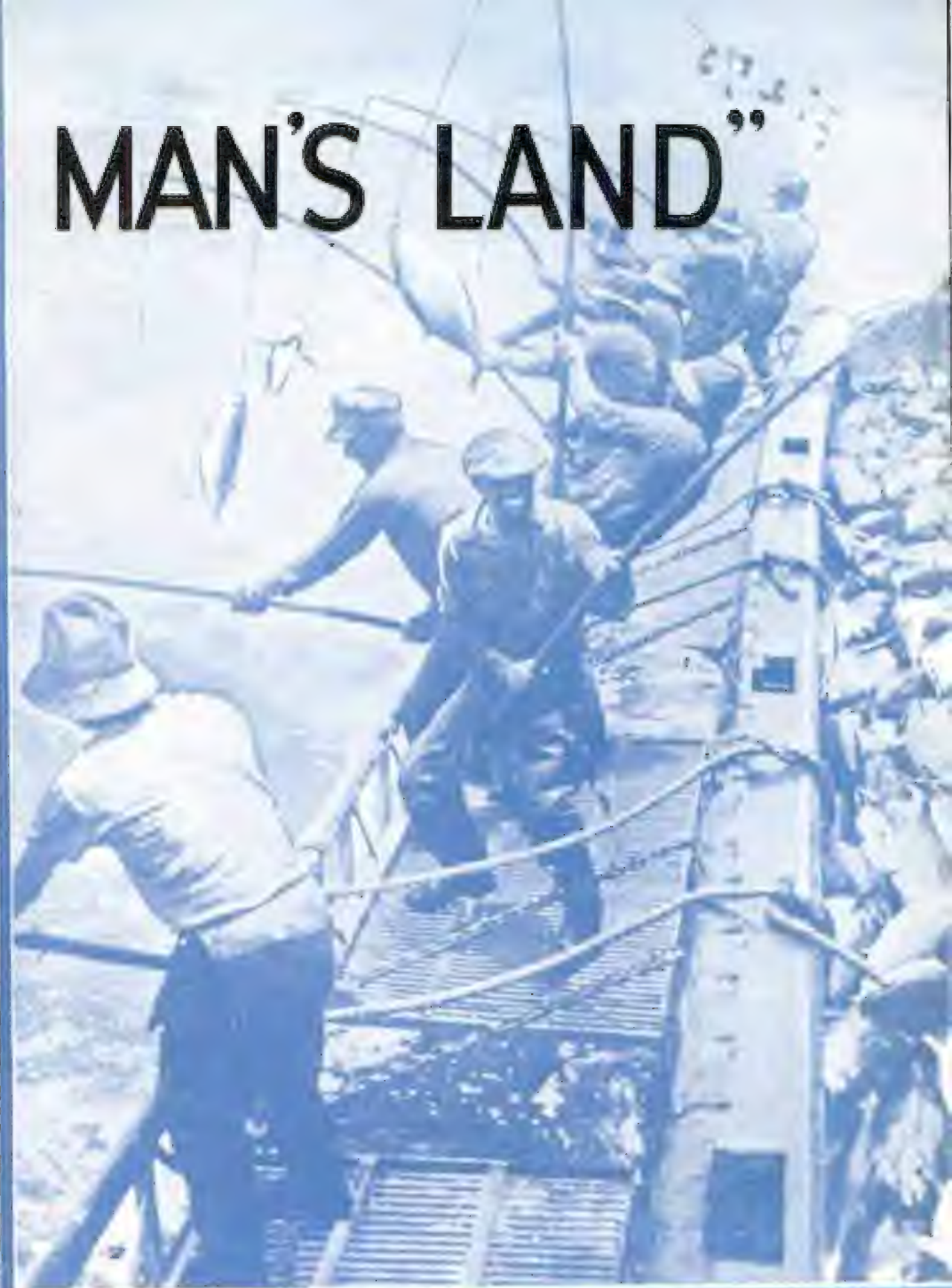
For more than twenty years California fishermen have monopolized the famous tuna banks off the western coast of Mexico and Central America, and the Galapagos grounds astride the equator, 600 miles west of Ecuador. No nation controls this "no man's land" of tuna. And now, suddenly, giant craft from the far ports of Japan, fueled and provisioned for twenty weeks at sea, are sailing into these tuna grounds, precipitating a struggle for supremacy of the industry which will be won by the nation with the most efficient ships and methods.



for "NO MAN'S LAND"

New clipper ships are being rushed to completion in American yards in the greatest expansion program in the history of the fleet and \$1,000,000 are being spent on ships, machinery and equipment. The largest of these pine-hulled vessels are 140 feet long, carry twenty-two officers and men, and can stow a payload of 420 tons of fish valued at \$40,000 in their refrigerated, insulated holds. The new clippers are fitted with radio compasses to aid in better navigation, and some have sounders for telling automatically, by the rebound of radio "echoes," the depth of water under keel.

The modern tuna fleet has gone completely Diesel. Their 350 to 550-horsepower directly reversible engines give



A new tuna clipper bound for the Galapagos. Above, the tuna fishermen in action on the grating outside the rail—and there's a fish on every line



to resist most effectively the strain they must endure during the breathless, furious moments on "live" tuna grounds. From the moment the lookout on the bridge sights the flying gulls wheeling overhead and the flash of fins in the water that indicates a tuna school, and yells "fish ahead!" life on a tuna clipper is action intensified. Atop the bait box—a wooden aquarium filled with salt water and live sardines on the aft deck—the "chummer" awaits his call with a

these boats a cruising speed of twelve knots, with auxiliary Diesels to provide power for refrigeration, and coupled to generators, electricity for light, pumps and winches. No former tuna fleet has been so considerate of crews. Cold sea-water coils circulate cool brine in every room where men live and assemble on voyage, reducing inside temperatures from twelve to eighteen degrees so the men may be comfortable no matter how hot it is outside. Ice cream, frozen dainties and chilled drinks, are now enjoyed on the fishing clippers, just as on the most palatial liners.

These long-range craft, capable of carrying enough fuel and provisions for the 10,000-mile round trip to the Galapagos, are scheduled to make seven or eight such voyages yearly. Whereas previous wireless equipment was short range, the short-wave apparatus carried by the tuna boats can circle the globe. The home base is now continually informed of operations, and knows days in advance the date of return of its fishing craft, so canning forces may be assembled the moment of arrival. This radio equipment also is used to flash information in code to other craft operating for the same concern, so they may be advised instantly of where tuna are running.

On the long trips south, the crews are taught to file their barbless hooks to needle sharpness, to clean piano wire leaders, and where to tape the stout bamboo poles



Decks on a tuna boat loaded clear to the bridge with one day's catch. Below, the "no man's land" where the tuna bite

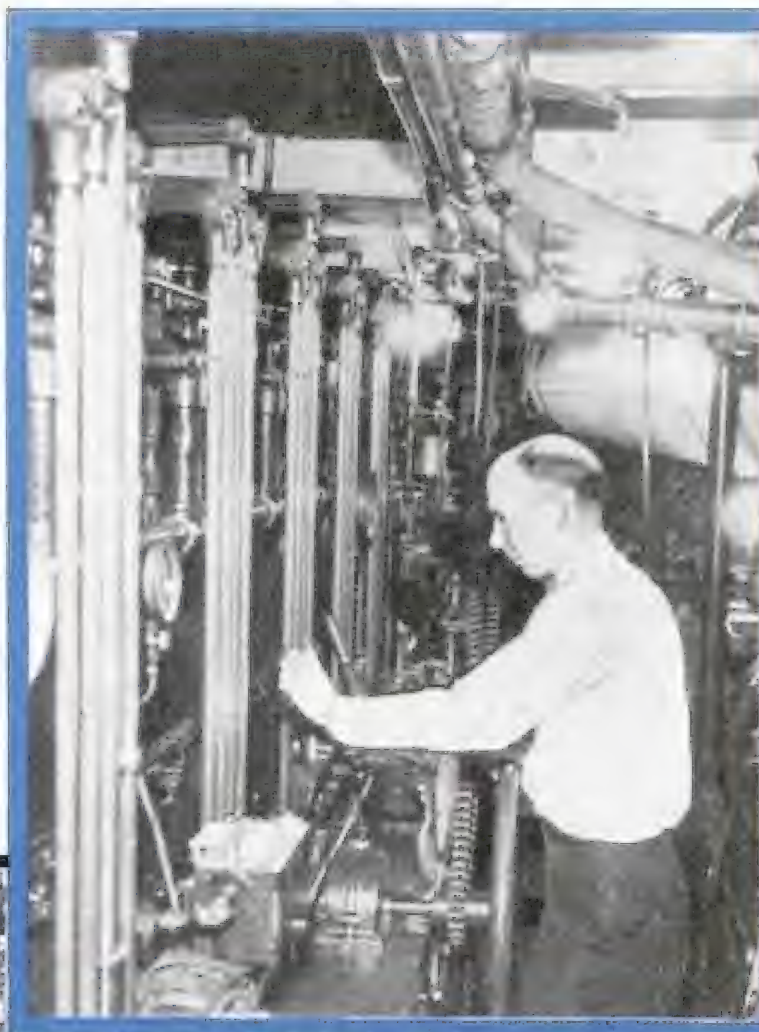
fine-mesh net on a pole. Quickly the boat noses her prow into the midst of the school. The engine-room and navigating officers quit their posts and the craft rolls free as every man snatches a pole and rushes to take his stand with others of the crew on metal-slatted gratings held horizontally over the ocean outside the railing.

"Chum 'em up," orders the fishing chief, and the chummer casts scoops of live sardines into the sea to entice the tuna. The

result is electric. Swish! A fish has struck. Timing his tug with pole and pencil-thick cotton line to a nicety, a man whisks the tuna overhead and in a twinkling it lies writhing on deck. The barbless hook rolls free from its mouth and the lure which, when wet, looks invitingly like a squid is returned to the foaming waters, the work continuing until darkness, or the fish cease biting.

Thirty tons are frequently caught by hook and line during the daylight hours of a day. But when the fish don't bite, what then?

Heretofore when food and fuel ran low, the boats were forced to run for home base, taking financial losses. But recent maneuvers of American interests are circumventing these losses. An ice plant,



Diesel engines of a tuna clipper and, below, a tuna fishing boat at her pier at San Pedro

refrigerator and Diesel fuel base are being constructed at Puntarenas, Costa Rica, where a California clipper, short of supplies, may slip in, disgorge its partial load

for transfer to a northbound boat and return quickly to the tuna grounds. With 5,000-mile trips back to packing bases with light payloads thus made needless, American tuna fisheries believe a large part of the pending battle for supremacy of this market already is won.

But why this long journey for tuna, once so prolific off the western coast of the United States and Mexico? Old salts who remember when every cannery need was met with fish caught a few miles off San Diego or Los Angeles, declare the detonations of the big guns of the American navy in target practice in the vicinity have frightened them away.

"All bosh," says W. L. Scofield, in charge of the fish harbor office of the California State Fisheries Laboratory. "The equator-ward parade of the clipper fleet is due entirely to the increased

(Continued to page 130A)

Upholstery Dry Cleaner Run by Electricity



Covering upholstery with dry suds from cleaner.
Inset, removing the suds

Portable and electrically operated, an upholstery cleaning machine is on the market. Dry air-blown suds are sprayed on the fabric through a blower and tube from the machine. No moisture penetrates the fabric, thus assuring even cleaning on delicate coverings. Head stains, mildew and grease spots are removed quickly. Coverings of the machine are made of molded rubber to deaden sound and to protect furniture. A special cleaning fluid to be used with cold water, is available. Fabrics dry in a few hours. The machine operates on alternating or direct current, twenty-five to sixty cycles.

Diamonds Found in Many Parts of the United States

Diamonds are found in many parts of the United States, instead of being confined to the single diamond mine in Pike County, Ark. Samuel G. Gordon, of the Academy of Natural Sciences, Philadel-

phia, points out that one of the largest diamonds ever found in this country was picked up at Manchester, Va. It weighed almost twenty-four carats in the rough and eleven and one-half when cut, with a value of \$4,000. Diamonds may be found along the eastern slope of the Appalachian mountains from Virginia to Alabama, along the western slope of the Sierra Nevada on the Pacific coast and in Wisconsin, Michigan, Indiana and Ohio. While most of them are small, the diamonds found in America are not inferior to those taken from South African mines.

Dresses Undergo Wear Tests in Hunt for Standard

Possibility of evaluating dress fabrics by performance tests and of setting up standards for serviceability is indicated in the national bureau of standards tests of women's dresses. How much wear may be expected, color fastness, breaking strength and aging characteristics are some of the questions which the bureau answers by means of a machine which subjects fabrics to severe tests. The machine is a recent development of government experts.



Subjecting dress to latest testing machine which measures life of the fabric

Curated Minerals

Motorcycle Police Man Machine-Gun "Nest"

Veritable machine-gun nests on wheels are the armored motorcycles recently supplied to the police at Rome, Italy. Both the driver and the gunner in his sidecar are protected by metal shields. The entire fleet participated in a demonstration of modernized police equipment at the Italian capital.



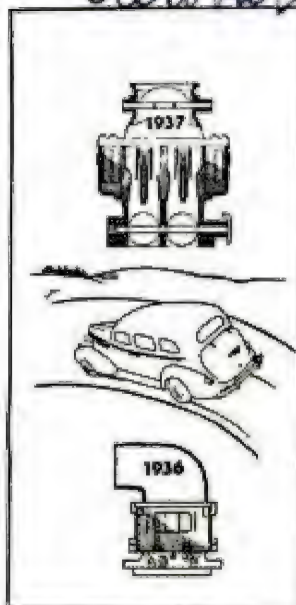
© Planet News, Ltd.

Motorcycle police of Rome, Italy, on review in their armored "bikes" with machine gunner riding in sidecar behind metal shield

Although camera film usually is "dated" for use within a year or two after manufacture, pictures have been made successfully with twenty-six-year-old film.

"Stunt-Flying" Carburetor Adapted to the Automobile

Taking a tip from airplane engineers, one automobile manufacturer is equipping latest models with a carburetor which provides unfailing flow of gasoline to the motor under all driving conditions.



The carburetor is designed to prevent "starving" the engine when the car is climbing steep grades, attempting a quick get-away, when turning corners and while stopping quickly. Of the dual down-draft type, the carburetor has two fuel nozzle tips located in the center of the bowl so that an unfailing supply of

fuel flows in. The bowl is separated by a wall at the forward end and by baffles at the base of the nozzles which prevent the jets from being robbed of fuel or flooded, as in conventional carburetors, under fast turns and sudden stops. The equipment is

comparable to that which permits a plane to fly in any position without affecting the operation of the motor.

Corrosion in Pipe Line Stopped by Deaerating Water

Corrosion that was seriously reducing the capacity of a huge water line at a Gulf Coast mine was conquered by deaerating the water by vacuum. Rust could not be prevented by a protective coating because the pipe was of welded steel, nine miles long. In four months corrosion cut its volume by twenty-two per cent. Engineers found that by drawing the water from its reservoir with vacuum pumps into a high tank they could remove about ninety-five per cent of the dissolved oxygen, and the remaining five per cent could be removed chemically at small expense. After three months' experiments with this method no rust was found.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

Full-Length Door Mirror

Mounted with Screws



Hanging a full-length mirror, which not only adds to the appearance of the room but is very useful

Full-length mirrors on hall or bedroom door are not only decorative but practical. A framed mirror can be had, ready to be fastened to the door with four screws.

Paint for Insulating Board Requires No Sizing



Requiring no sizing and no sealers, a paint made for application to insulating board bonds completely with the surface, yet does not penetrate. It bridges the spaces between the fibers to form an evenly distributed film, so

that in many types of finishes and colors only one coat is necessary on boards once considered difficult to paint because of their tendency to absorb great quantities of liquid paint. Drying rapidly, a board painted with the new product may be put into service within a few hours. Scrubbing with soap and water improves its appearance and wearing quality.

71500

Concrete Found Self-Healing under Certain Conditions

Broken concrete will heal under proper conditions, it has been found by investigators. A number of test cases showed that complete fractures of concrete culvert pipes had become self-welded and in some cases the weld was stronger than the original culvert. This self-healing action is the result of calcium hydroxide, which is exuded by concrete, being converted into calcium carbonate in the presence of moisture. Dampness or long-continued high humidity is required for the reaction.

71499

Heating of Speaker's Stand Latest for Outdoors

Heating the air around the speaker's stand at outdoor meetings is the latest accomplishment of Detroit engineers. At a recent gathering in Navin Field, complete



Heating equipment in place beside speaker's stand at an outdoor gathering

wood, stone, brick, paper.

Mitchell, David
Murray

124-9-10 St. Wilmette, Ill.

heating equipment supplied warm air through two ten-inch pipes to the platform, one on each side of where the speaker stood. The heat was generated by oil burner and blower. Fuel oil was conducted from a fifty-gallon drum to the burner by copper tubing. So efficient was the arrangement that the speaker was able to appear without overcoat or hat, though the temperature was near freezing point. The unit was installed by Gar Wood engineers. Possibility of the idea being adapted to other winter gatherings such as ice carnivals, was expressed by observers.

Model Boat 'Sails' on Road When the Wind Is Favorable



Photographer catches "master" of model ship when there's no wind and he must push the craft along the highway

Meter Shows Amount of Dust in Air You Breathe

Devised as a means of determining the amount of dust that may be in the air, a handy meter has been tested successfully in Boston. The device takes a sample of air and analyzes it, showing quickly the percentage of dust.



Taking a sample of air with meter which analyzes it and shows amount of dust

When the wind is favorable, a model barquentine constructed by a New Zealand man may "sail" along the highway. It was built to make a trip by road from Auckland to Wellington to raise funds for a new gospel ship to replace one destroyed by fire when nearly completed. When there is no wind, the builder pushes the boat along on the small wheels with which it is equipped.

Camera Sets Itself for Exposure with Aid of Photocell

Judging the proper aperture and exposure time for a photograph may soon be left to the camera itself. Dr. Albert Einstein, noted scientist, and Dr. Gustav Bucky of New York have patented a camera equipped with a photoelectric cell arrangement which automatically adjusts the camera for the existing light. An auxiliary lens receives the light from the scene to be photographed and transmits it to the "electric eye." A screen of varying transparency mounted in the main lens system is adjusted according to the degree of light falling on the photoelectric cell, admitting the proper amount of light to the photographic plate when the shutter is snapped.

L. Davis, Culverdale

5876th M

Available for Advances

Conquering

DEATH



and dawn than in the daytime. Truly, there's a sinister meaning for motorists today in the words of that old refrain, "I'm Afraid to Come Home in the Dark." Going home—or anywhere else—becomes dangerous business after dark if you drive a car.

Improved highways, safer cars, better traffic regulations and other safety measures actually are decreasing daytime accidents. But the night accident trend is moving upward despite all preventive measures. And darkness—lack of visibility, inability to see—constitutes the major difference be-



ARE you afraid of the dark? Probably not, but cold figures prove you should be, if you drive a car. You should cultivate a healthy fear of the night because darkness is the ally of death on our highways.

Traffic accidents are snuffing out human lives in America at an average rate of about 100 a day, 3,000 a month, 36,000 a year. And when the sun goes down, the death toll goes up. Statistics indicate that from three-fourths to four-fifths of all automobile traffic is by day. But more than half the fatal accidents and almost half the non-fatal ones occur at night. The average accident hazard per vehicle mile by night is three or four times that by day.

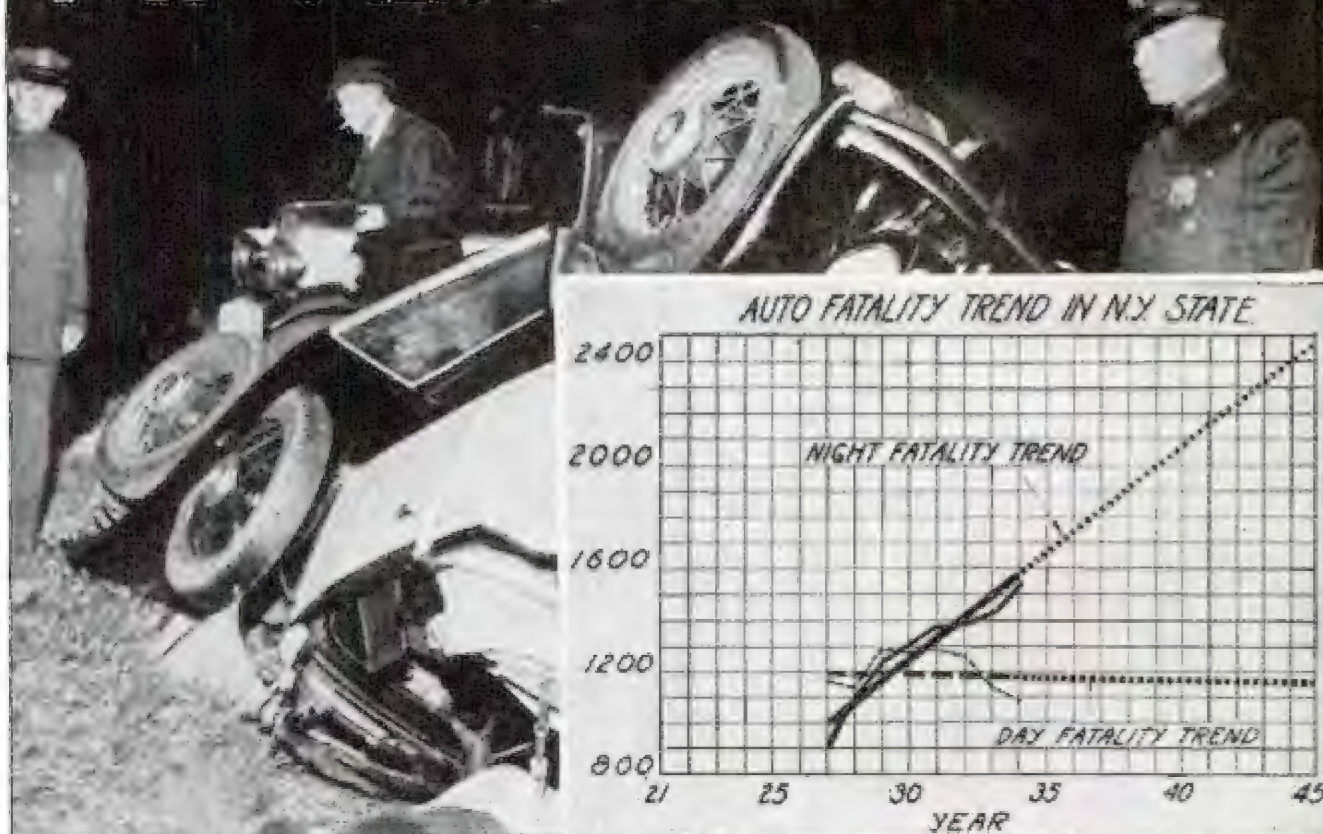
And the fatality rate per accident is sixty-four per cent greater between dusk



Photos Courtesy General Electric Co.
Top, left, road lighted at night and same view by day. Below, same road, same car, same man on lighted and unlighted highway

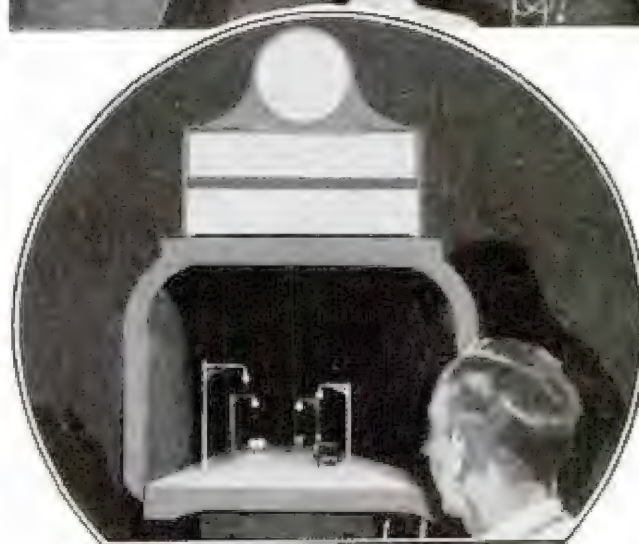
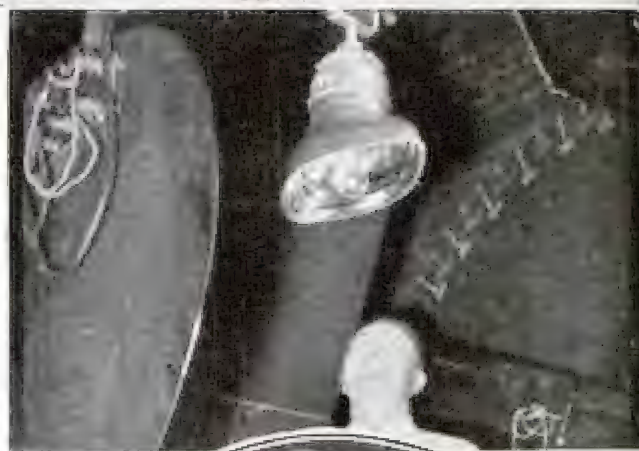
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AFTER DARK



tween day and night driving. Modern automobiles are equipped with the best headlamps engineers have been able to design, but even the greatly improved lights in use today cannot approximate the visibility offered by daylight. Powerful lights could be produced which would flood a road with light but they could not be used without blinding approaching drivers by their glare. Glare has been defined as "light out of place" and it has been virtually impossible, thus far, to keep all the light from powerful lamps "in place"—that is, focused on the road ahead—when the lamps themselves are attached to a swaying, pitching car. A method was devised for depressing beams in passing, but not all drivers utilize this safety device. So engineers have been forced to compromise between illumination and glare in designing car lamps because it was found that too much glare was just about as dangerous as not enough illumination. Some investigators believe the problem eventually may be solved by using a special glass to polarize the headlight beams.

Speeds at night of forty, fifty or sixty



Top, night fatalities are going up. Center, modern highway lighting unit. Bottom, model highway used for light experiments



Top, man in dark clothes seen with low car lights and street lights. Center, high headlights, no street lights, man in gray. Bottom, same conditions, man in dark clothes

miles an hour are not uncommon. If your brakes are in average condition and the road surface is good, you require about 165 feet to stop at forty miles an hour, including the time it takes you to think—the interval between the time you see something and the time you decide to do something about it. And at fifty miles an hour you need 243 feet to stop, while at sixty you require 330 feet. But if your brakes are poor or your tires are worn or the pavement is slippery, you may need 600 feet. How many headlamps offer such visibility?

Since solution of the problem of making the highways safer at night seemed to involve some method of providing better visibility, road and safety officials sought the advice of lighting engineers. And it did not take the lighting engineers long to supply the answer.

"Light your highways rather than your cars," was their verdict. And they demonstrated that good visibility can be obtained and maintained on any road by properly arranged fixed lighting which reduces glare to a minimum while greatly increasing the ability to see clearly. Highway officials ridiculed the idea. Think of the cost, they said, of lighting our 3,250,000 miles of roads.

Then the lighting engineers did some research work. And here is what they found. There is a limited mileage—about 50,000 miles for the whole United States, and less than 1,000 miles in most states—where the hazard per vehicle mile by night is six times that by day instead of the average of three or four. And the fatality hazard on this heavily traveled mileage is ten times that by day. Though but a small percentage of all improved roads, about three-fourths of all rural highway accidents at night occur on this mileage.

Illuminate this 50,000 miles of

road and there would be an annual saving of 5,000 lives at least, plus 10,000 personal injuries, plus 100,000 cases of property damage!

But, you meditate, lighting even a 50,000-mile stretch of road would cost a lot of money—millions of dollars. Well, here's one answer to that. How much are 5,000 human lives worth, or, projected over ten years, how much are 50,000 human lives worth? But that's not the real answer. The real answer is that the lighting program would pay for itself three times over by the economic loss it prevented. Here are the figures, supplied by Kirk M. Reid, lighting engineer of the General Electric company:

"The installation cost of the 50,000 miles of lighting is estimated at \$125,000,000 to

(Continued to page 128A)

Dart Board Flashes Light to Score Hits

F1304



When dart strikes target a light flashes below to show number of points scored

"Document Glass" Saves Papers by Filtering Out Light Rays

Historical documents and valuable manuscripts can be placed on public exhibition under a special glass which prevents



Examining historical papers in display case under glass which stops damaging light rays

their deterioration from light. This "document glass" filters out the ultraviolet rays which cause ink and paper to fade and discolor. Important records which have always been sealed against light are now being shown in display cases made of this glass. The New York Historical Society has built a special case for General Burgoyne's Articles of Surrender at Saratoga, Washington's acceptance of the freedom of the city of New York, and the record of Nathan Hale's execution.

When a player throws a dart at a game board introduced in London recently, the number scored flashes on the board. When the dart strikes the board it causes a short circuit which directs electric current to the lamp located at the number.

Mantelpiece with Radio Set Latest for the Home

Combining a mantelpiece and a radio is the achievement of one exhibitor at the recent biennial Building Exhibition in London. Called the "radiomant," the accessory for the home has the double appeal of utility and decoration. The radio may be removed for servicing.



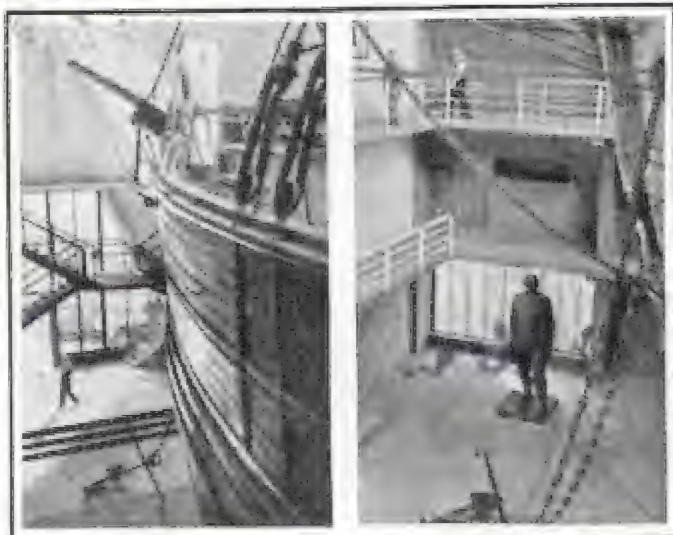
Installing radio receiving set in mantelpiece

Museum Built as Last 'Haven' for Polar Ship

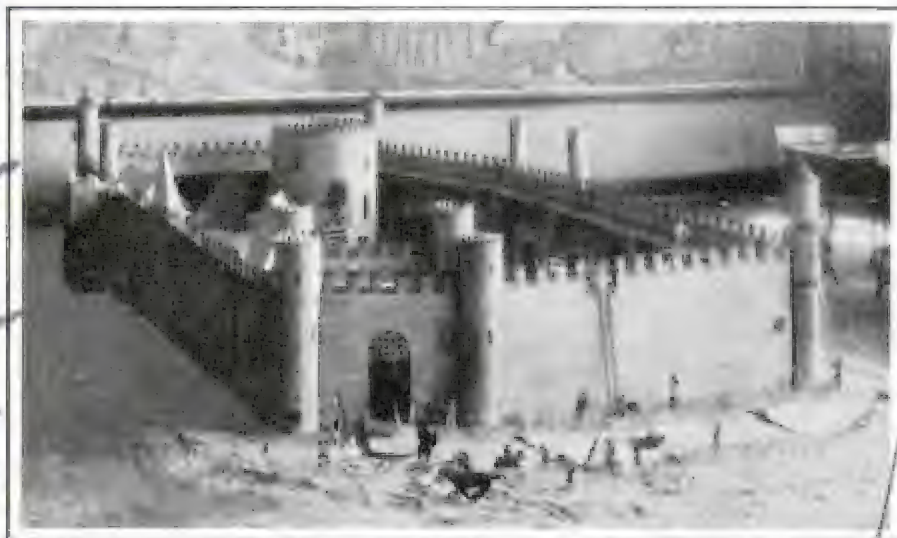


Its polar adventures over, the research ship "Fram" in which Nansen and Amundsen explored both Arctic and Antarctic seas has found a final resting place. A museum has been built around the vessel at Bygdøenes, near Oslo, Norway, and it is enshrined there as a permanent national memorial. The "Fram" was built by Nansen for his voyage into the polar ice fields north of Siberia in 1893 and withstood terrific pressure from the floes. In 1910 Amundsen used the "Fram" to take his men and supplies on his race to the south pole. The famous vessel is now high and dry in the triangular building overlooking the fjord.

Triangular museum, above, was built around the famous ship "Fram" in which Nansen and Amundsen explored the polar seas. At the right is a view of the vessel in its permanent home, a Norwegian national memorial, and the statue of Roald Amundsen. The museum overlooks the fjord at Bygdøenes, near Oslo, Norway



Paper Knights Scale Walls of a Model Medieval Castle



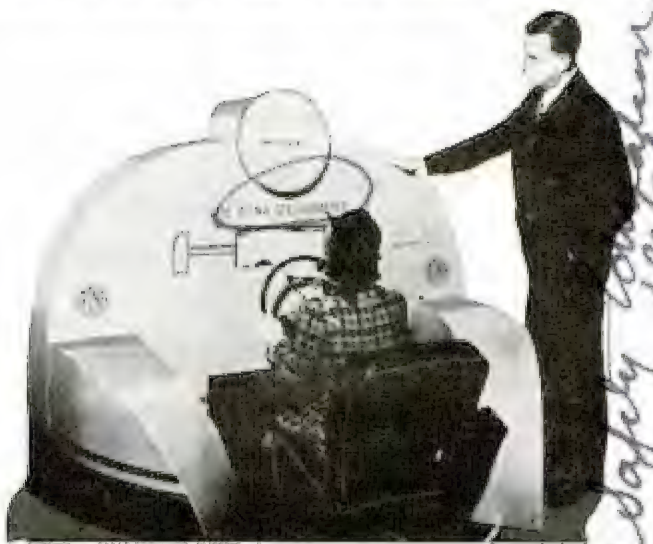
School children built this cardboard castle with its drawbridge, portcullis and feudal knights. It is colored with chalk

Cardboard knights joust on horseback and scale the walls of a medieval castle modeled in faithful detail by school children of Albany, Calif. The manor house is surrounded by castellated walls manned by feudal soldiers. Tiny boats cross an imitation moat, and the gate is guarded by portcullis and movable drawbridge. Towers and shields, too, are movable. The entire model is of cardboard, colored with

chalk to harmonize with a mural in the background which depicts a landscape typical of the middle ages. The class spent two months constructing the model.

Movie of Highway Tests Driver's Steering Skill

If you can keep the "cut-out" hood of the car where it belongs while the road wanders at random in a moving background, you rate 100 per cent at the steering wheel. To test the motorist's steering skill and alertness in reacting to visual stimuli, an accident insurance company has developed a recording mechanism. The driver sits in an automobile seat facing a small window through which he sees a moving highway and the cut-out nose of his car. As he maneuvers the steering wheel to follow the meandering road and avoid its obstacles, the cut-out hood responds to the wheel and at the



As driver manipulates steering wheel, "cut-out" nose of car follows moving road on rectangular screen

same time the driver's accuracy in steering is recorded on a paper disk. The test lasts forty-five seconds. The average driver rates about ninety per cent in keeping the car on the right side of the road.

Megaphone Sends Bugle Call to Far Corners of Air Field



Bugler's call is carried to every part of air field by means of this big megaphone installed at Scott Field, Ill.

Bugle calls are carried to every part of the airplane landing field at Scott Field, Ill., by means of large megaphones. When ~~the~~ bugler sounds mess call, for instance, he steps to one of the megaphones, places the bell of the bugle to the megaphone mouthpiece and sends the call roaring across the field.

Ignition Cable of Stainless Steel Starts Cold Motor Quickly

Much quicker starting of cold motors in winter weather is possible with an ignition cable of stainless steel for which a patent has been granted to government engineers. A much higher voltage potentiality can be gained since the flow of electricity through ferrous metals such as stainless steel is impeded less than in copper. Ferrous wirings, too, are stronger and cause less radio interference, making them ideal for use in airplanes, and their resistance to corrosion gives them another advantage over copper in seaplanes.

Boys and girls under sixteen are the entire executive and operating staff of a complete railroad in Russia operated between stations two miles apart.

Aetna Casualty and Surety Co.

Railway Age

Vol. 1 2/1936

W. H. Dillman
Bureau of Science & Experiment
Standard

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WOODEN SHIPS

346 Strand, London, W.C.2.

England



The "Red Jacket," one of the most beautifully proportioned clippers ever built. Her figurehead represented a Seneca chief for whom the vessel was named.

By Cappy Ricks

THERE have been few works of man around which has settled such a definite halo of affectionate regard as that evoked by the memory of the old-time clipper ship, the stately and intriguing product of America's designers who alone on earth were responsible for the birth of ocean speed.

These magnificent ships—perfect instruments for their purpose to the last detail—for a generation and more carried in their bellying sails the ocean supremacy of the world, and held in their spacious holds the cream of all ocean-borne traffic. They were, of course, of wooden construction, and in themselves they represented the highest peak of the woodworker's craft ever attained by man. They were not, however, as often erroneously supposed, built of soft wood; instead, all the flyers were built of American oak, often internally bound with iron in an intricate and exceedingly skillful manner, never quite

Imitated by any other nation's builders.

They were, though, lightly built with plenty of "give" in their construction, and it was this elasticity which gave to them their entirely unique and supreme sea-kindliness and rendered them so speedy that no other wind-driven ships in history ever came up to their achievements; no other ships ever built attained twenty knots or over, nor did 400 miles in a day, as did these queenly clippers which in their day held every ocean record.

The first "extreme" clippers were built for the China tea trade, the sea-trade par excellence, but the noble type really arrived at its peak during the Californian gold rush of forty-nine and the fifties of last century, and the contemporaneous Australian rush in which American-built clippers carried half a million gold-seekers to the land of the Southern Cross, and took to Europe millions of ounces of gold dust and bullion alone.

Illustrations from Book entitled
Sail.
and **IRON MEN** *71219*



All pictures © The Blue Peter Magazine, London

12 St. Mary Ave,
E.C. 3 London, Eng.
 "Flying Cloud," built in 1850. On her maiden voyage she traveled from Boston to San Francisco in eighty-nine days, a record never broken by any other clipper.

The first clipper to prove a success was "Coquette," a small ship of but 420 tons, sailed by that magnificent seaman and skillful navigator, Elridge the elder. She astonished the world by making on her maiden voyage, in 1843-4, the passage from Boston to Hong Kong in ninety-nine days, a performance eclipsing by several days anything previously accomplished.

A later clipper, "Rainbow," of 720 tons, the first ship to be given "hollow" bows, made the outward passage, to Canton, in ninety-two days, and returned to Boston in eighty-eight, a most remarkable achievement for so small a vessel. This ship, though, was considered to be too "extreme"; she was early in her career named a "coffin ship," with a reputation for "losing men overboard when no one was looking." She disappeared with all hands on her fourth voyage, considered to have been sailed right under.

This swift vessel's record was soon beaten. In 1846, Waterman the elder took the new "Sea Witch" from Canton to New

York in eighty-one days, and, it was said, never once left the deck of his ship for more than a wash during the long passage. In one day this ship reeled off 361 miles, an average of fifteen knots, easily a record for a day's run. It was Waterman's practice to padlock his chain topsail and topgallant sail sheets, and keep the keys on his person, to insure that no one but himself could reduce sail. Only one other man was ever known to adopt this practice, the indomitable Forbes of "Marco Polo."

"Surprise" was another wonderful ship, finest of her day and fastest; she went from New York to San Francisco, 16,000 miles, in ninety-six days, under that prince of ship captains, Dumaresq. On many occasions during the passage she logged seventeen knots, the highest ever attained to that date by any ship, sail or steam.

"Staghound," a truly noble ship, was the next to attain seventeen knots, but she was driven to desperation to attain it.

marine pictures - suggest - see also



"Sovereign of the Seas," first clipper to attain a speed of twenty knots. She made 413 knots in one day's run, an average speed of seventeen and one-half knots

Then came the wonderful "Flying Cloud," well ahead of anything in the world then afloat. Built in 1850 by the Boston ship-building wizard, Donald Mackay, she went on her maiden voyage to 'Frisco in eighty-nine days, a record which was never broken. In five successive California voyages her average passage was 100 days, when the average ship's passage lay around 140. Her tonnage was 1,783, and she was the loftiest ship of her day.

This noble ship put up many records, some of which still exist; she did 374 miles in a day, and reached eighteen and one-half knots on many occasions. In 1858 she covered 1,501 miles in four days.

The first of the "large" clippers over 2,000 tons, was the "Oriental," built in 1849 to be the first ship to take tea from China to London upon the repeal of the navigation laws, and she made the passage from the Pagoda Anchorage, Foochow, to the London docks in ninety-six days, beating the fastest British ship by no less than thirteen days.

The flight of clippers during the gold rush amounted to some thousand, all magnificent ships and the finest fleet the world

has ever seen. Over 200 were being built annually, for these were stirring times in the sea trade. They were, by far, the largest, and swiftest ships afloat at the time and they were handled and sailed in faultless manner. One of the first was the noted "N. B. Palmer," which on her maiden voyage crossed the North Pacific, port to port, in twenty-seven days, taking five off the record, doing 396 miles one day, an average of sixteen and one-half knots. "Swordfish," a product of the same Maine yard, beat this passage by a day in 1856, reeling off 6,000 miles on a passage from California to Swatow, a record for the west-bound passage.

In the same year the noble "Sovereign of the Seas," 2,684 tons and the largest of the Mackay built clippers, having 109 in her crew and commanded by Laughlan Mackay, brother of the builder, attained the phenomenal speed of twenty knots, with 413 for the day's run, an average of seventeen and one-half. This stupendous feat, unique in that it was made to the westward in a region given over almost wholly to westerly winds and mountainous seas, was achieved off Cape Horn.

Fingerprints Alike Only Once in Undecillion



tograph of a right index finger and subjected its enlargement to a microscope to determine various identifiable points in an area less than one-fourth inch in diameter. Next he took a print of the same finger with dark powder and photographed the print which was enlarged 100 diameters and then 200 diameters. Ruling off each picture in squares he counted the identifying points in each. In the larger picture he finds as many as twelve points peculiar to that finger alone. Each square in the picture represented an area of less than one-sixteenth of an inch in diameter. In a full print there are more than 3,072 such points and a minute difference in any one proves the print came from another finger: Colored powders and ultraviolet light reveal prints once invisible to the camera.



Top, photographing finger. Bottom, left, 200-diameter enlargement shows within each square how ridges would appear under microscope. Center, 100-diameter enlargement. Right, classification area of finger

If a fingerprint is found at the scene of a crime, there is only one chance in an undecillion, many times the population of the world, that it belongs to more than one person. The undecillion is written 1,000,000,000,000,000,000,000,000,000,000. Supported by statisticians, J. Edgar Hoover, chief of the G-men, federal bureau of identification, points out that there is practically no chance for an innocent person to be convicted of a crime. Fletcher Gould, a California photographer, has proved with pictures the remoteness of identical fingerprints. First he took a closeup pho-

F1481 Transmission Is Key to Defeat of American Racing Cars

Why foreign racing cars won the Vanderbilt Cup run on Roosevelt Raceway last fall may be traced to the superiority of their transmissions over those on American cars. Foreign entries were equipped with a special gear set, usually with four speeds, mounted in conjunction with the differential on the rear axle unit, and shifted electrically by hand buttons, preset to give the selection when the driver depressed the foot lever. In contrast,

Police Dept.

Det. Andrew R. Boone,
1157 S. Broadway,
Los Angeles Calif.

no. 1936
K. W. Dayton Cars 1967 2, 27th Cleveland Ohio
 American cars used rear drive with conventional three-speed forward transmission and rear axle gear ratios of dirt-track specifications. American transmissions were too fast on the turns and too slow on the straightaways and American drivers drove the entire race in high gear while foreign drivers shifted gears quickly up or down, for turns or straightaways, utilizing every ounce of speed and power when and where needed. With the electric gear shift, foreign drivers came out of turns in third speed and then shifted into high. Their best speeds on straightaways were around 150 miles per hour.

#147
**Spare Ignition Coil for Car
 Saves Delay on Road**



Spare ignition coil shown in place, ready to operate motor stalled on road

K. W. Dayton Cars 1967 2, 27th Cleveland Ohio
 When the regular ignition system fails from such causes as defective contact points, unsynchronized points, burned-out coil, defective condenser or damp motor, an emergency ignition coil now on the market will start and drive the car. It can be installed in less than one minute by clipping it to the radiator tie-rod and connecting its cables to the distributor, the generator and to a convenient ground.

should not give
 In thirteen states requiring automobile brake inspection, traffic deaths were reduced six per cent in the first seven months of 1936 compared with a one per cent reduction in other states.

Phone Built in Mouthpiece of "Talking" Gas Mask



acme
Microphone fitted inside this gas mask permits the wearer to talk over the telephone

Paris
 To permit communication during a gas attack or while working at a hazardous occupation, a gas mask developed in France has a microphone built into it. An ordinary handset telephone is held to the ear and the wearer's voice is carried outside the mask by the microphone attached.

F1446
**Day-and-Night Wind Indicator
 Aids Pilots Miles Away**

Bellevue, Ill.
 Visible five miles away, a forty-foot indicator at Scott Field, Illinois, shows pilots the direction of the wind, enabling them to land properly. The indicator is lighted with red and green electric lights



W. W. Work
Giant wind indicator installed recently at Scott Field, Ill., to aid pilots

W. W. Work
 to make it visible at night. It replaces several smaller indicators formerly used at the flying field which could be seen from only a short distance.

Oxyacetylene Shaping Tool Cuts Ten-Inch Steel

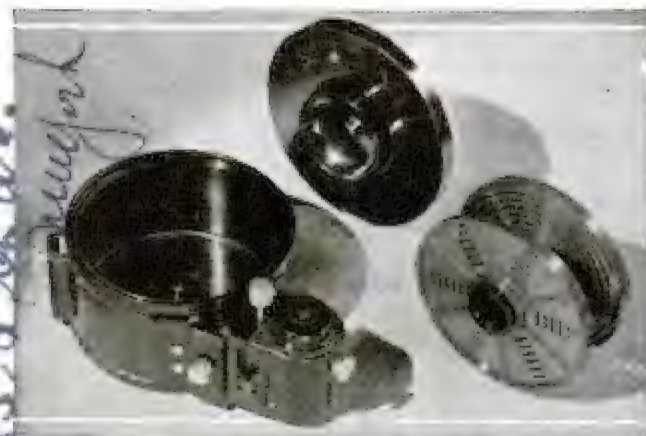


Block of steel ten inches thick being sliced by oxyacetylene machine in a demonstration at metal show

Cutting through ten inches of steel is an ordinary job for an oxyacetylene tool demonstrated recently at a metals exposition. This automatic shape-cutting machine severed a ten-inch steel billet in quick time.

Daylight Photo Developing Tank For Miniature Films

Development of thirty-five millimeter photographic film without a darkroom is made possible by a light-tight tank in which the film can be immersed without removing it from its daylight-loading magazine. After taking pictures, the film



Film in daylight-loading magazine is placed in small chamber and wound into light-tight developing tank

is rewound in the camera until about two inches remain outside the magazine. Then the magazine is slipped into a small antechamber of the developing tank, the projecting film end engaged by sprockets and, with the cover on tight, fed into the tank proper by winding a knob. The various solutions can be poured in and drained without exposing the film to light.

Rubber Poncho Has a Window for Writing in the Rain

Policemen writing "tickets," reporters covering a story, drivers making deliveries in the rain could benefit by a rubber pon-



You can write notes in a rainstorm and keep your paper dry if the poncho has a window in front

cho recently placed on the market. It has an eleven by twelve inch celluloid window in the front, at just the right height for writing notes, visibly, under cover. The poncho is of lightweight rubber with a head hole, draping over the shoulders to allow full freedom for the arms in driving.

Ⓐerial pictures taken from army planes can be developed in a flying darkroom and dropped by parachute within fifteen minutes to aid the ground forces.

Electromagnet Draws Needles Out of Finger

Electromagnet and compass came to the aid of the doctor when a Providence, R. I., mill-worker was injured in a textile plant and had several needles imbedded in his finger. The finger became infected and physicians feared it would be permanently stiffened by the steel pieces which lay close to the middle joint. The injured man was taken to an electric research laboratory and a small compass was used to determine the direction of the imbedded needles. Then the patient moved his finger between the poles of a strong electromagnet, and felt the needles creep to the surface.



Injured man inserts hand between poles of a powerful electromagnet and feels the magnet draw out fragments of steel needle imbedded in finger

British Post Office Built on Wheels Travels to the Public

Mounted on wheels and propelled by motor, the latest British post office travels to the public. It is intended for use at race meetings, cattle shows and similar gatherings. It is equipped with two telephone

booths and telegraph printers which will transmit photos of messages in facsimile to all parts of the world. Letters also may be mailed in the ordinary manner, a drop slot being provided in the vehicle.



Post office on wheels pictured as it served the public at English race meeting

Explosive in Apricot Pits in Great Demand

Material for high explosives has been discovered in apricot pits, resulting in a demand much greater than the supply at Sydney, Australia. The production of dried apricots and apricot jam in Australia is now a mere by-product business in comparison with the more profitable business of producing apricot pits for war industries in other countries.

It costs two and one-half times as much to transmit electricity a hundred miles as it does to ship coal by rail the same distance.

Cont. H. G. ...
San Francisco
Western Camera and
Packer 369 Pine
Editor, Electrical World
Scene Service

RACING *the* MAN-MADE



Left, mechanics tuning the engine of a racing plane just before the start of a closed-course contest. Below, the racing plane has speed in every line. Note how the engine is cawled in



IF THERE were room in the tiny cockpit of a racing plane for you to squeeze in beside the pilot, you would get a thrill to last the rest of your life. And the chances are one ride would be enough.

A race is a terrifying nightmare to anyone except a trained pilot. The nerve-racking roar of the heavy engine a foot or so in front, the shattering jars as the plane smashes through rough air and the sickening swoop of a pylon turn make closed-course racing a sport for only the hardest pilots. Dodging trees and some-

times flying under high-tension power lines at 250 or 300 miles per hour takes more than sheer nerve. One slight misjudgment of time or distance is the end.

From the cockpit the ground below looks like a liquid smear. Objects ahead are visible but they zip toward you at terrific speed. Pilots select their own altitude to fly around a course and racers such as Earl Ortman, second place winner in the 1936 Thompson trophy classic, like to do their racing twenty or thirty feet off the ground. It's more dangerous so low and

Capt. Thomas E. Stinson, Jr.
10555 Dolman Ave.
Los Angeles
Calif.

Hangar # 5
Aurora

METEORS

the plane and pilot take a beating from the rough atmosphere that's as bad as bumping over concrete, but the blanket of thick air close to the ground allows more supercharging and speed.

Making a tight turn around a pylon, with the plane tipped on its side to reduce skidding, tends to crush a pilot down into the floor of the cockpit. Imagine making a ninety-degree turn in an automobile at 250 miles per hour. A pylon turn is almost as hard on a pilot as pulling out of a terminal velocity dive, the difference being that a test pilot needs to dive a new airplane only once while a racing pilot may make sixty pylon turns in a 150-mile race. Ortman prepares for his races by taping his body tightly from hips to shoulders to reduce the strain. That leaves only his chest unprotected and by the end of a race it is covered with black and blue marks. The reason is that in a fast turn his chin is crushed down into his chest and bruises the flesh in spite of all his efforts to hold his head erect.

Besides taping his body, Ortman tapes his helmet to his head because he likes to use a semi-enclosed cockpit instead of one entirely housed over



A 250-horsepower in-line racing engine and, at right, two racing planes rounding a pylon together. Both the pilot and the plane take a beating in this maneuver



Modern racing plane and a 250-horsepower, in-line, air-cooled airplane racing engine

with transparent Pyralin. A heavy bounce is apt to throw his head half an inch above the cowling and without the tape the wind would rip the helmet from his head. Ortman lost a wrist watch that way a few years ago when he put one hand out to wipe away an oil smear on the windshield.

"The touchiest part of a contest is the 'racehorse start,'" says Ortman. "In this the planes line up across the field with engines idling and the pilots ready with one hand on the throttle. Then, at the drop of the flag, the planes roar down the field and into the air. The danger is that with the planes only a few yards apart one of them might veer from its course and crash into another. Once in the air it

is a free-for-all scramble to get around the first pylon. From that point the planes string out according to their speeds.

"The first few laps are usually the fastest since by the end of that time the leader has discovered how much faster he is than the next man and begins to throttle down so he will still have the lead but not strain his motor more than necessary.

"You might think that, once he gets into the air, a pilot can sit back and give all his attention to the race. It would be a lot easier if that were so. While jockeying through the traffic toward the first pylon his job is to get his retractable landing gear up. This may take a dozen manual operations, throwing switches, working the hydraulic hand pump, turning valves, and testing the gear to make sure the wheels are actually up. During the rest of a race the pilot keeps one hand busy adjusting the fuel mixture and occasionally switching from one fuel tank to another to keep the plane in balance. In between he must watch the different temperature-indicating instruments and turn a selective switch that shows the head temperatures of the individual cylinders."

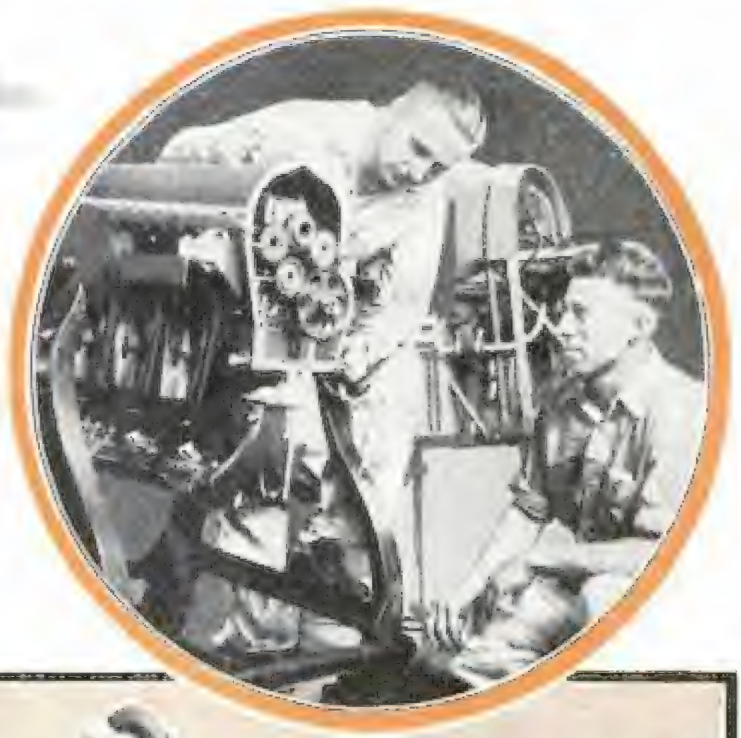
The real racing occurs between planes with approximately the same speed. Then it is up to the pilots to cut corners and whip their planes around the pylons as close as they dare. With the planes equally matched, it is the pilot who flies the straightest lines and makes the fastest turns who wins. In one close race Ortman actually flew under a bridge that hap-

Menasco Mfg. Co. 6714. Mc Kenley Ave. Los Angeles Calif.

pened to be on the course just to avoid the delay of zooming over it.

Staying on the course is one of the hardest things that confronts a pilot. The checkered pylons are hard to see from a distance of several miles especially if oil wells or similar structures are in the vicinity. Sometimes a pilot who is busy banking his plane around a turn and at the same time keeping clear of other planes heads for the next pylon by compass, depending on the degree to which he changes course to point him accurately at the next marker.

Race rules say an overtaking plane must clear one being passed by at least 100 feet but in the heat of a



Top, inspecting air-cooled, in-line inverted racing engine and, below, wreck of a racing plane which turned over as it was landing at high speed

race one may pass within ten feet of another. When two pilots battling it out for the lead roar by, a slower pilot dodges out of the way if he sees them in time. He knows that at close quarters the revolving stream of air from one of their propellers may turn him flat on his back and possibly cause him to dive before he can regain control.

In the straightaways a pilot "freezes" onto the stick. To correct for every bump and lurch of the plane is difficult because at high speed a slight correction results in over-control. To prevent this the pilot locks the controls as much as possible. The control stick is adjusted so its top is only

half an inch under the instrument panel. The pilot holds the stick at its top with his hand squeezed under the bottom of the instrument board. This braces him against the tendency of the stick to kick around in rough air. With the stick held like this a pilot can perform any maneuver without moving his hand more than a quarter of an inch. Racing planes are so sensitive that a movement of a fraction of an inch on the controls is enough to make a tight turn or a steep climb.

Most pilots use the right hand to guide the plane. The throttle, fuel mixture adjustment, hydraulic hand pump, and me-

(Continued to page 116A)

Explorers Fly Camouflaged Plane into Jungle



chuk
Natives swiftly paddle their canoes out of the way as Mr. and Mrs. Martin Johnson pilot their flying boat, its cabin spotted like a leopard, just above the surface of a river in central Borneo

Their flying boat roaring down over lakes and rivers like some giant bird, Mr. and Mrs. Martin Johnson startled the natives of Borneo on their recent trip into

the jungle. The ship was camouflaged with painted spots like a leopard's. The Johnson's, noted hunters and explorers, gathered a cargo of wild animals in Borneo.

Engine Heat Regulator Gives More Warmth in Auto

Thermo. O. Guard



*Inset, heat regulator for straight "8" engine.
Above, V-eight installation*

Devised to warm up the motor faster and to supply more warmth to the interior of the automobile through the car heater, a thermostatic guard which operates automatically is on the market. Installed in the water circulation system, it cuts off the flow of cold water from radiator to motor and places the water pump in direct circuit with the heating system, thus circulating the water over and over from the motor through the car heater until the temperature is quickly brought to the proper intensity. When sufficient quick heat has been generated the thermostatic chamber in the device automatically becomes a safety valve and prevents overheating by releasing small quantities of cool water from the radiator at necessary intervals through the circulating pump

Automotive Sales Co.

F1456
D. B. 6/30/38

direct to the motor. This in turn displaces a similar amount of hot water which flows out of the motor to the top of the radiator where it is cooled. The guard is made in two models, one for V-type and the other for in-line motors. No tapping or drilling is necessary.

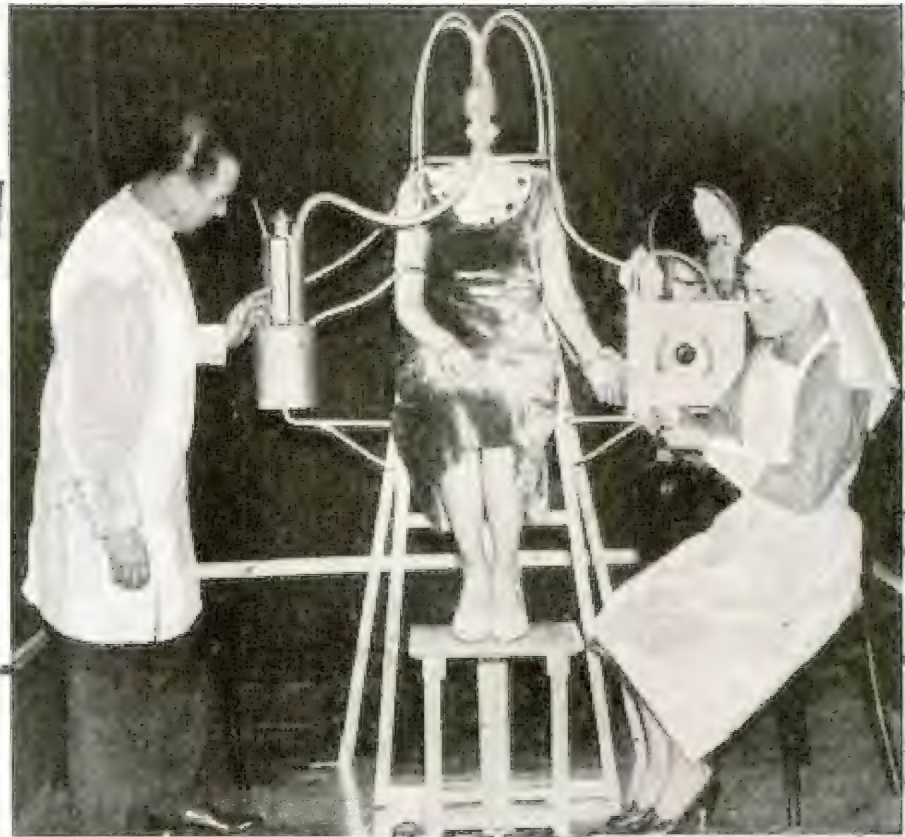
Giant Dirigible's Steel Skeleton Takes Shape

Slightly larger than the "Hindenburg," the German dirigible designated as the LZ-130 is taking shape in the Zeppelin works at Friedrichshafen. The huge steel framework of the craft, which is a sister ship to the "Hindenburg," is in place and soon the "skin" will be applied to the outside of the skeleton.



Framework of the "Hindenburg's" sister ship as it appeared recently in construction hangar

"Headless Woman" Illusion Is Latest in Crowd Thriller



Doctor and assistant checking amount of nourishment and pulse of "headless" woman. Can you detect how this illusion is created?

Crowds gather at a London store in the window of which is an apparently headless woman. The effect is heightened by a tube leading to the throat. Through this tube goes the food which the woman is supposed to consume and the amount of nourishment is indicated on dials. The camera fails to reveal the trick, but it appears to be similar to the head-without-a-body illusion featured in circus side shows for many years, which is accomplished with the aid of mirrors.

Age of Average Automobile Is Nearly Five Years

By analyzing passenger-car registrations, engineers have found that the average motor car now in use is 4.71 years old. Since the survival life of an automobile is 8.4 years, the average car is now well past "middle age." Sixty per cent of all the cars in use at the end of 1935 consisted of the three low-priced makes, 10,845,295 out of 17,896,616 cars.

Scene Service 1/4/36

Pedestrian Lane Markers Flash Traffic Signals



Pedestrians may cross when stud in street shows green light like traffic signal

Illuminated from within, studs marking pedestrian lanes at some of the busier intersections in Paris flash red, amber or green to match the traffic lights. Thus, when the traffic lamp tells the pedestrian to stop, a line of red dots extends across the street. A line of green dots tells the pedestrian when he may cross. The studs which are made of metal, have a glass window on the side toward the walker, through which the lights are visible.

Electric Light Easily Installed in Any Refrigerator



If your refrigerator is not equipped with light, you can install in a minute a unit which automatically makes contact when you open the door and floods the interior

with light. It is easily fastened to the refrigerator shelf, bulb pointed inward, and a plunger shuts off the light when the door closes upon it. Dry cells are used. It is rustproofed and fully protected against contact with liquids.

Revolving Floor Displays Cars in Modern Showroom

Among the features of the modern automobile showroom are a revolving floor for displaying the cars, scientifically designed display lighting to eliminate glare, invisible glass windows, escalators, a motion-picture room, air conditioning and scientific acoustical characteristics. A showroom of this type recently was opened in New York by the Chrysler corporation. The circular revolving floor, fifty-one feet in diameter, is set flush with the floor and moves around an "island." It turns silently on roller bearings at a speed of four revolutions per hour, being powered by electric motors beneath the floor. Rising from the island in the center are two escalators which carry visitors to a large salon on the second floor. Both the escalators and the big turntable are controlled from a central electric panel on the first floor



Pointing to separation between floor and revolving platform in auto showroom

and by convenient emergency buttons. Lighting of the first floor consists of one-color illumination arranged to obtain one-half or full intensity. Duplex fixtures in the room provide spotlights and special lighting effects. The interiors and undersides of the cars on the revolving floor are illuminated from receptacles on the floor.

Bates and Gates, 16th Street, New York

London Broadcasts Daily Television Program



Photos © Harris & Ewing

Television programs now are being broadcast each day in London, both the direct and film process being used. Top picture shows television camera being employed for direct transmission by Marconi system and, in circle, watching the broadcast on cathode-ray receiver. Bottom, using television camera to broadcast image of singer

E. M. J.

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Carl Thomas & Stinson Dr. 10558 Halmar
 Univ. Los Angeles Calif

... "TUNING IN"



are all exceedingly color blind and can see only a little of the light the stars radiate," remarks one of the astronomers of the Carnegie Institution. "Our eyes are tuned to receive only a small segment of the whole light spectrum. They might be compared to a radio receiver that tunes across a narrow band and misses the rest of the broadcasts that are on the air. The stars radiate a great deal of invisible light that we



Picture of stars as seen in telescope and, above, metal plate ruled with 15,000 parallel lines to inch, used for studying visible and invisible light in spectroscope

BEAMS of invisible light, short-wave radio messages and "atom-smashing" rays are the latest tools of astronomy.

Starlight alone tells only part of the story of the heavens and now scientists are fingering radio dials and operating weird "cosmic-ray telescopes" in their study of the stars.

"You might say that in a broad sense we

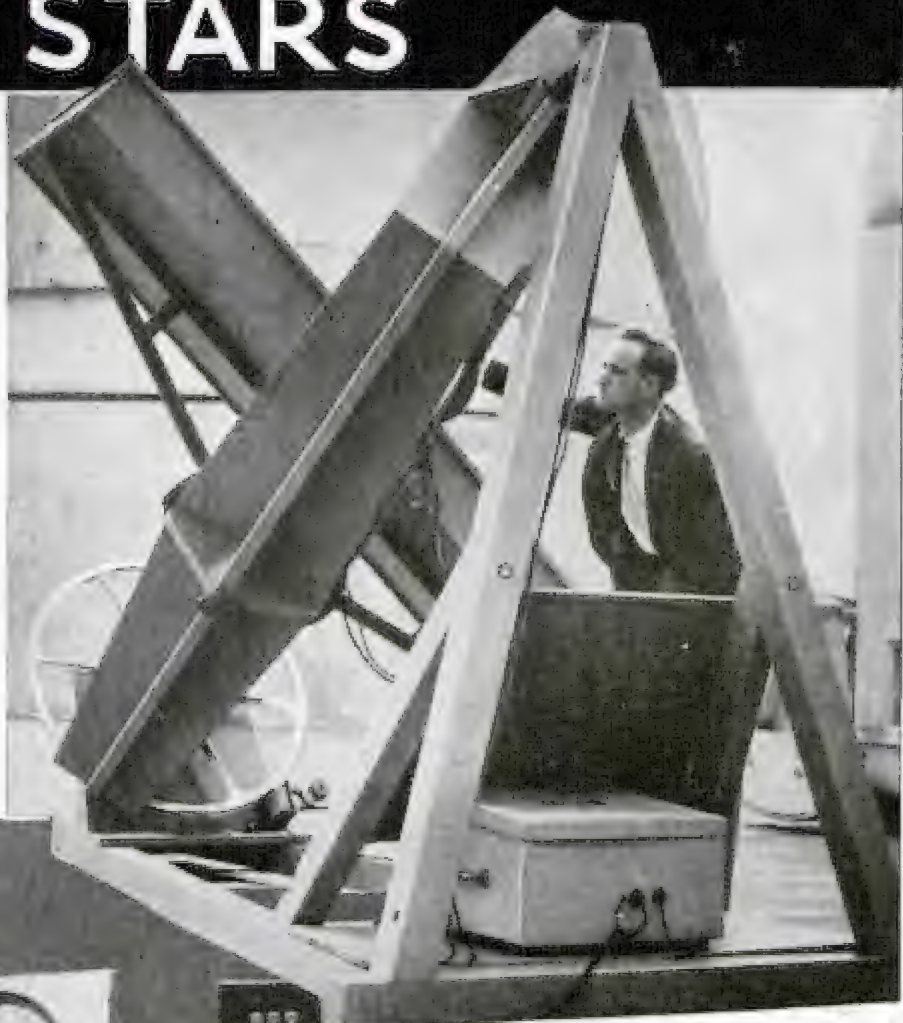
cannot see without some special means."

Light itself is only a narrow section of the entire electromagnetic spectrum. Energy on many other wave lengths aside from light is being radiated by the stars and today the problem is to "tune in" on the stars on as many wave lengths as possible. One of these wave lengths happens to be radio.

on the STARS

For several years radio research men have been puzzled by mysterious signals in the form of a steady hiss received on 14.6 meters, along with static from local and distant thunderstorms. There is nothing secret about the signals and you can listen to them yourself if you have a powerful enough receiver and can get away from local interferences.

Sweeping the skies with



Top, cosmic-ray telescope which "rings up" incoming rays on counter. Below, using cathode-ray tube as sensitive voltmeter to measure the strength of radio signals from space in an effort to determine their source

a directional type of antenna to learn where the signals were coming from led to the discovery that the hiss originated at some point away from the earth. At first it was thought that the sun was acting as a giant broadcasting station because no matter in what part of the sky the sun

happened to be, the signals seemed to be coming directly from it. But later the direction of the signals shifted and started to precede the sun. Then a new source had to be found. After a year of patient listening the origin of the strange static was traced to a fixed area in space near the center of the Milky Way system.

Last summer at the California Institute of Technology the signals were studied with the aid of one of the most powerful receiving stations ever built. The ignition of an automobile half a mile away or static from a vacuum cleaner or electrical refrigerator at that distance

is enough to blast in the earphones. The sensitive fifteen-tube set can pick up a thunderstorm half way around the world. To escape from man-made interference the station was set up in the Mojave desert and the "messages from the universe" were measured with a sensitive vacuum-



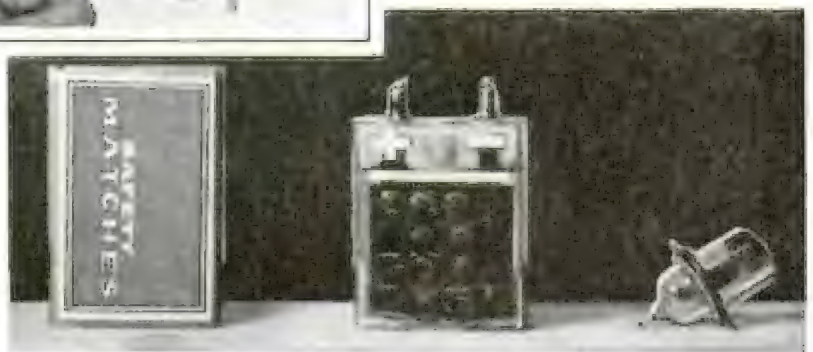
picked up by other dust particles that have lost some of their own electrons. The re-absorption of the electrons leads to the radiation of electromagnetic waves. The frequency of the wave depends upon the size of the dust particle and it happens that the average size results in a broadcast on 14.6 meters. At least, this is what the scientists think.

An example of wave-length change something like this happens when sunlight strikes a black pavement in the summer. The light is reflected back as heat, which is still the same kind of energy as light. In this case the pavement acts as the transformer that changes the wave length.

You may think of radio waves as extremely low-frequency light waves, if you like. At the other end

tube type of voltmeter. So far the identity of the celestial broadcasting station remains a mystery. The latest idea is that instead of originating on some distant star the radio waves are actually created by dust particles in space. Space is usually thought to be devoid of all matter but it is estimated that the earth picks up something like a pound of meteor dust and other material every hour as it moves around the sun. Throughout limitless space an average of one dust particle possibly one-millionth of an inch in diameter may occupy every 100 cubic miles. The theory is that these particles act as transformers and change light waves into radio waves.

What happens, the scientists think, is that light from a star strikes a dust particle and causes it to emit electrons. These shoot through space and eventually are



Drawing of stratosphere balloon and parachute carrying instruments for studying cosmic rays and, below, size of storage battery and radio tube carried by balloon compared with matchbox

of this energy scale, in which light waves are about at the middle, are the high-frequency waves called cosmic rays. In between radio and light are heat waves and infrared waves, and between light and cosmic rays are the ultraviolet, X-rays, and Gamma rays.

The stars radiate ultraviolet light and there is no doubt that they also give off X-rays, although the earth's atmosphere effectively screens out most of them. Cos-

mic rays, however, are able to pierce the atmosphere and in these the scientists have available another wave length for star study. Like the radio signals, the cosmic rays are thus far a perplexing puzzle. No one as yet has found out how or where they are created. If they could be "manufactured" artificially like light or radio they might be easier to understand.

Recently research workers at the California



Quartz crystals, above, before they are ground, and finished, natural quartz lens for studying invisible starlight. Below, movable chart of Milky Way used in finding direction of radio signals from the heavens

scope seems to have deepened the mystery. Day after day, the report was: "The rays are coming from directly overhead." The signals were strongest when the telescope was pointed at the zenith and faded in intensity when it was turned toward the horizon. The trouble is that "directly overhead" means nowhere in particular. It represents a different point in the heavens every day in the year. The signals are strongest from overhead, it seems, because there is less air directly above to weaken the rays.

If an ordinary star is responsible for cosmic rays the sun should be a strong near-by source. Scientists have had to rule this out because reception of the rays

Institute of Technology built a "cosmic-ray telescope" with which they hoped to find out where the rays come from. The strange device was placed in an equatorial mounting so that it could be pointed toward any part of the sky. The telescope consists of four vacuum chambers in which the rays are detected, arranged so that the recording apparatus "rings up" the reception of a wave only when the ray passes through all four tubes. This means that the telescope should work best only when it is pointed directly at the source of the rays.

Instead of solving anything, the tele-

seems to be constant night and day, no matter where the sun happens to be.

One theory is that cosmic radiation is released during the vast explosion that occurs when a normal star "blows up" into a super nova, increasing its brilliance many hundreds of times. This only happens about once in 700 years in every galaxy of stars like the Milky Way. Since the explosion may last only a few weeks, and cosmic-ray reception seems to be constant year after year, the theory suggests a universe tremendously larger than can ever be surveyed with telescopes.

(Continued to page 118A)

Los Angeles, Calif **Piano Kept Always in Tune with Tubes for Strings**



Tones are produced on this piano by striking metal tubes instead of strings. Notice its curved keyboard

Instead of strings, a piano recently invented by a Californian has metal alloy tubes which produce a tone similar to that of a small piano or harp. A practical element is that these tubes are always in tune. The keyboard is slightly curved and has a four-octave span. The instrument is quite compact and weighs only 150 pounds.

F1448 **Queer-Shaped Racing Auto Sets Speed Records**

Speeding over the new Frankfort highway in Germany, Rudolf Caracciola recently established two new records, one for the kilometer and one for the mile.



German racing car is shown as it sped along highway on record trials

The car in which he established the marks is odd looking. Its rounded shovel-like nose has an opening resembling the air scoop used on another racing car to aid in cooling the engine.

F1411 **Wavy Lines on Road Warn Driver of Intersection**

Wavy lines for 200 feet on each side of a dangerous intersection on a road in Los Angeles constitute a new method of warning motorists that they are approaching the corners. The lines are expected to be



Wavy lines defining traffic lanes warn driver of dangerous intersection ahead

especially helpful to the driver following the straight white traffic lines on foggy and rainy nights, warning him before he enters the intersection.

F146 **Ear Is an Imperfect Microphone Adding to What It Hears**

From the scientist's point of view the human ear is an imperfect microphone which adds harmonics to the notes it hears. Actually, physicists say, it is difficult to prevent any sound-detecting device from adding overtones which were not present in the original sound. The ear does not pass sound vibrations on to the brain exactly as they were received, but adds other higher tones.

*Harry F. Noakes 586
Huangamta, Air
sheira
Wade
Calif
Mercedes-Benz
Dr. E. B. Newman
Southwest College*

Super-Speed Plane Is "Eye" of British Army



Photos © Planet News, Ltd.

Its speed has been kept a close secret, but this British army ship is understood to be one of the fastest fighting planes built. Known as the Westland army cooperation plane, it is to be the "eye" of the land troops, its duties including artillery spotting, aerial photography and reconnaissance work. In the picture above are seen the removable "spats" which enclose the landing wheels and the head-lights for night landings



Acme

In the space of twelve months this high-wing monoplane was designed, built and put through demonstration tests. The top picture shows the speedy ship on a test flight, and in the middle it is on the line ready for inspection. Notice its rugged bracing and the long, glass-covered cabin. At the left is a head-on view revealing its unusual landing gear, bullet-shaped body and three-bladed propeller. This is the first of a fleet of super-speed planes of similar design destined for aerial liaison duty

Electric Pump for Oil Well

Replaces Familiar Derrick



This heavy duty hydraulic pump, operated by electricity, has taken the place of the traditional derrick in a Los Angeles oil field

Landmark of the oil field since the industry was born, the trelliswork oil derrick may be outmoded by the latest hydraulic pump. Electrically operated, it is designed for heavy duty and is already in service in the Los Angeles oil fields. The new pump is said to work faster and more quietly than the derrick.

Air Conditioning Helps Save Timbers of "Old Ironsides"

Air conditioning has been installed on the historic old frigate, "Constitution," as part of the precautions being taken to preserve the wood in the gun and berth decks. Many of the original timbers in "Old Ironsides" deteriorated and were renewed, years being spent in searching for replacement wood of the proper quality and seasoning. The yellow pine originally was obtained in South Carolina and Georgia while Massachusetts and Maine provided the white oak. During the winter, the gun and berth decks are heated for the comfort of visitors to this old ship. Installation of a simple heating system would reduce the air's relative humidity and dry

out the timbers, resulting in excessive shrinkage and checkage, so engineers determined the best atmospheric conditions for the wood and installed an air-conditioning system to circulate clean air heated for the comfort of visitors and humidified to preserve the wood.

Garage Door Lifted by Motor without Leaving Car

Turn a key, touch a button and the garage door rolls up. It is as easy as that to open or shut the rolling steel doors recently placed on the market. Since they are the lifting type, they are unaffected by winter snow and ice, and being steel they do not warp and jam. Beside the driveway is a post in which you can insert a key without leaving the car, unlock it, then press the button operating a magnetic switch and a motor hoists or lowers the door.



Motorist opening his garage door by pressing electric button after turning key in post beside driveway

Carrier Corp.
850 Franklin Ave

Demongiated by C. L. Bush
Los Angeles, Calif.

Columbus Co.
F. H. H. Co.
3000

842.50 } job
47.50 }

Experts Scale Giant Stacks on Repair Jobs



Stack worker on the job. This particular stack is more than 500 feet high. Right, worker preparing to ascend. Note small seat on which he sits to repair brickwork hundreds of feet in the air

Repairing the giant stacks of smelters is an occupation which keeps a small group of experts busy in the Rocky Mountain region, as far south as Mexico and out to the Pacific coast. The work is surrounded by danger, the men sitting on boatswains' chairs or big galvanized buckets filled with cement attached to a rope sometimes 500 feet long. The wind swings the repairmen into the air, then back against the rough brick of the stack. The men also work on a platform set on brackets tied to the stack by a steel cable. Although there is no guard rail or rope the workers walk around the platform without thought of their danger. Smelter stacks grow old in twenty-five to thirty-five years, due to the chemical action of fumes in the stack. The chemicals deposit on the inside of the stack and then become sulphated from sulphur fumes and expand, causing cracks. Windstorms and lightning are other causes of stack failure. The repairmen's job is to remove crumbling brick and mortar and put in new brick with a special plastic cement. Steel bands to strengthen the stacks are installed frequently. Concrete also is used

in the construction of stacks. It is cheaper than brick, but does not last as long and repairs are difficult. Lightning and windstorm cracks were repaired recently in Tacoma, Wash., on a 575-foot stack. Thirty-nine feet in diameter at the inside of the base and twenty-five feet at the top, the stack contains 2,400,000 bricks.

Equal Cuts of Pie Are Marked by Notched Rim of Pan



Making it easier for the housewife to serve equal cuts of pie, the rim of a new pan is notched. Prior to baking, the pie-crust is pressed

down over die-formed V-humps halfway across the rim of the pan. The hump or notch is made only half way so covered pies may be sealed as effectively at the notch as elsewhere. During the baking, the pie shrinks away from the humps and the resulting notches mark the line of cut even after the pie is removed from the pan.

Washington S. Culver, chm

W. M. Mutton Cloth

The HOME that



There's no stale tobacco smoke in the electric home—it is sucked down an air vent back of the bookcase. Below, cool air emerges from the vent in the china cabinet. When the doors are closed the air passes to a bedroom above.

PART II

ONCE, we looked upon electricity as a mysterious and destructive force. Today we regard it as a laborer whose tireless energy has been harnessed by industry to do work which otherwise would require the muscle power of hundreds of thousands of men.

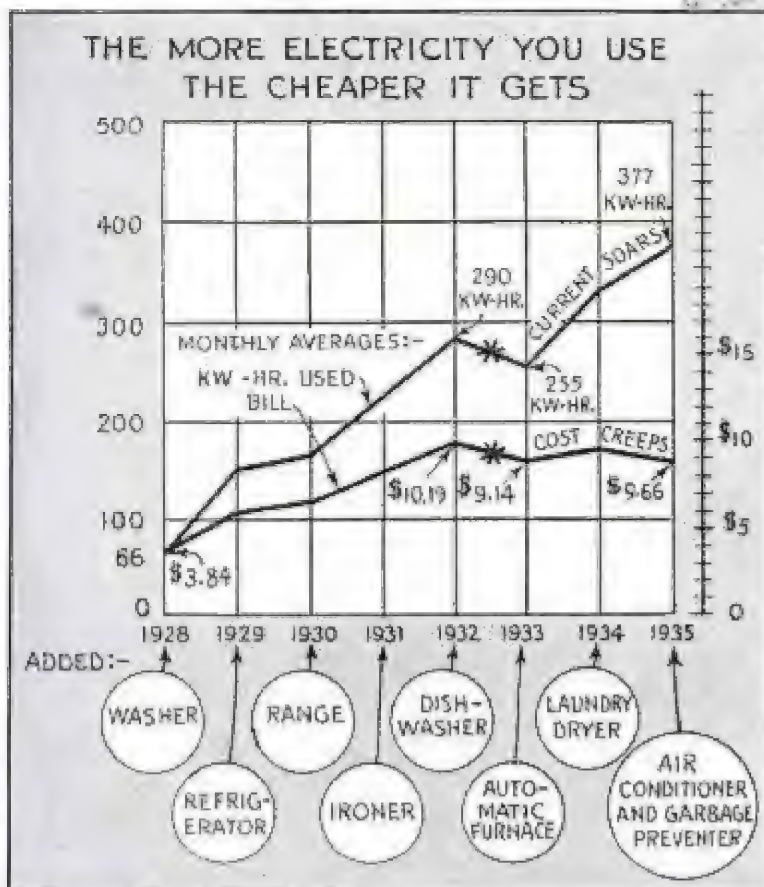
And electricity now is preparing to assume an even more important role in our daily lives. More and more, we are viewing it as an indispensable household servant, a Handy Annie capable of doing most of the home tasks which have occupied millions of housewives for thousands of years.

Up in Schenectady, N. Y., Charles M. Ripley has demonstrated that this Handy Annie is a good housekeeper. All he did was to supply her with the necessary tools—modern electrical appliances—and turn over the work to Annie. The result is a home that virtually runs itself, quietly,



Runs Itself

efficiently, effortlessly. An electric oil furnace keeps the house at an even temperature, an electric range turns itself off when food is cooked, an electric refrigerator makes ice without attention, an air conditioner, a room cooler, a dishwasher, a washing machine, an ironer, a dryer, a garbage preventer and a score of other tools used by Annie operate with a minimum of supervision. To transform his house into an all-electric home, Mr. Ripley in a period of about nine years has acquired electrical household equipment



Photos Courtesy General Electric Co.

Chart showing how cost per kilowatt-hour goes down as consumption goes up. Top, light under lily pad which illuminates fish pool so it can be enjoyed after dark.

which is valued at more than \$2,000.

"Ah, hah!" you exclaim, "I knew there was a joker somewhere. So you need \$2,000 worth of machinery to do all this?"

Well, the joker isn't where you think it is. It's true that Annie, the electrical maid, can't work without tools and it's also true

that she uses equipment in Mr. Ripley's home which he estimates is worth more than \$2,000. But here's the joker. Mr. Ripley says this \$2,000 worth of equipment didn't cost him a cent and he supplies figures to prove it! Let's allow him to do his own arithmetic.

"It's like this," says Mr. Ripley. "A washwoman used to come to our house every Monday. We paid her three dollars, lunch and carfare—\$15 a month. We didn't need the laundress after we bought the electric washer—terms, \$10 down and \$14 a month. In less than a year we owned a \$165 washer, paid for with money which otherwise would have gone to the washwoman. The 'juice' to run it cost \$1.25 a year, also paid out of the laundress' wages we saved.

"Well, once we owned the washer, that \$15 a month we had been paying the laundress began burning a hole in my pocket. So we bought a refrigerator for \$250—terms, \$10 down and \$20 a month. We paid for that with the \$15 a month saved on our washing plus about \$6.50 a month saved on ice and food formerly spoiled. The refrigerator made the electric bill go up \$1.25 a month. This too, was paid out of savings.

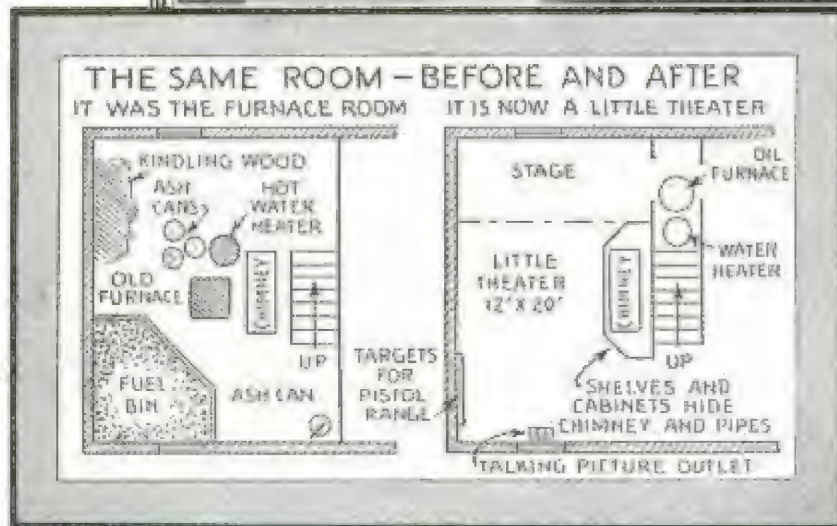


which we couldn't measure in dollars, but there was another angle too.

"For every bright, shiny, new appliance that came into our home, half a dozen old-fashioned, unhandy and often unsanitary things went out. Consider for a moment what we got rid of. Our cellar used to be shunned. It was cluttered up with coal, ash cans, kindling, papers, pokers, shovels and a big coal bin which took up one end.

"By the end of the second year, we owned both a washer and a refrigerator, paid for out of what we had been paying the washwoman and for ice and spoiled food. Our plan certainly was working. We decided to keep on going, using the money saved by the present appliances to buy the next. The third year we bought a \$250 electric range. Our old stove was turned in for the down-payment. All the other payments of \$20 a month each could have been made with the money saved by the refrigerator and washer. But in addition, we saved the gas bill for cooking and we found we saved on our meat bills. The electric bill for the range averaged \$2.28 a month.

"At the end of the third year we had a \$250 range, a \$250 refrigerator and a \$165 washer, all paid for by savings these machines effected for us. We bought everything else the same way, using the money saved by all the previous appliances to buy the next one, and never buying the next one until the last one was paid for. Of course, we were enjoying better food and many comforts, conveniences and services



Top, getting a morning workout in the electrified home. Center, sun lamp mounted over bath tub. Bottom, the basement of the electric home before electrification and afterward

The electric oil furnace got rid of all of them and the cellar is now a basement converted into a recreation room. We got rid of dish washing and drying, sooty pots and pans, scrub boards, dishpans, garbage cans, rug beaters—we even got rid of matches.

"Now let's recapitulate. The entire elimination of some expenses and the reduction of others under the old system, saved enough cash to buy all the modern appliances we use today. Here are the figures. Before we had the automatic furnace we used two fuels—coal and gas—which cost \$14.13 per month. The new furnace uses one fuel—oil—which costs \$9.29 per month, or a saving of \$4.84 per month. The washer saved \$15 a month paid out for a laundress. The refrigerator saved \$6.50 previously paid for ice and lost in spoiled food. That's a decrease of \$26.34 a month."

"But," you shout triumphantly at this point, "what about your light bill? If you're running the whole house with electricity, someone has to pay for all the extra 'juice.' How about the light bill?"

"Ah, yes," replies the man whose home runs itself, "the light bill. I had almost forgotten that. Well, when we began our program of electrification our light bill averaged \$3.84 per month. Now that we have finished, we find that we are using six times as much electricity as we used to. But we don't pay six times as big a light bill. We pay about two and one-half times as much as we did when we started. Our average bill now is \$9.66. Deduct the difference, \$5.82, from the \$26.34 we saved by electrification, and you have a net decrease per month of \$20.52. That's \$246.24 a year—almost five per cent interest on \$5,000. I'm glad you mentioned that light bill."

When you buy electricity, you buy work. You can't see the current that does your work but it can be measured far more accurately

(Continued to page 124A)



Mr. Ripley pointing out the bug killer on his porch. At left is a colored light which illuminates the porch when there is a party



Putting on a trick lighting entertainment in the basement of the Ripley home. Kindling and ash cans used to occupy the space where this little theater is



Wash day in the electric home. The electric ironer is in the foreground, the electric washing machine in the background and the electric clothes dryer at the left

F1342 Silk Hood for Sandblaster Prevents Inhaling Dust



Did with
Dangerous dust is excluded by this rubberized silk hood, protecting the sandblaster from silicosis

Weighing only forty-three ounces, a rubberized silk hood invented by a navy safety engineer gives complete protection from dust while sandblasting. Inhaling sand and dust frequently causes silicosis, a dangerous industrial disease, but with this hood slipped over the head and shoulders, extending to the waist, the worker is safe. The helmet weighs about half as much as most previous protective masks.

F1399 Instant Fire Alarm for Home Plugs into Light Socket



Vale
Within a few seconds after fire breaks out in your home the household can be warned by a howling alarm which is simply screwed into a light socket. This detector utters an unmistakable

Newton, Mass
shriek if the temperature in the room rises at a sustained rate of fifteen or twenty degrees per minute. This "rate-of-rise" thermostat will catch the fire before it has reached dangerous proportions, yet will not cause false alarms from ordinary changes in room temperature due to weather or winter heating of the building. Plugged into a ceiling socket in basement, attic or closet—danger spots for fires in the home—it will detect any sudden surge of heat almost instantly. The rate-of-rise feature is operated by a small air-expansion chamber with an extremely sensitive diaphragm which bellows out when the temperature rises in the air chamber and closes an electrical contact. There is an additional thermostat which, in the event a smoldering, slow fire has not actuated the alarm, will sound the howler when the room temperature reaches 150 degrees. The signal operates on alternating current, and uses about eight watts. A tiny neon lamp consuming four-tenths watt shows that the current is on. The detector readjusts itself after the fire is extinguished and need not be replaced. Extension howlers and detectors can be connected for remote alarms.

F1418 Reference File Is Floodlighted by Lamp Attached to Base



Record file mounted at angle for quick reference and easy reading, and lighted to save eyestrain

Eyestrain in index reference work can be reduced to a minimum by using a file floodlighted by a lamp which is part of the

Art Metal Construction
1924

*Chicago 407 S Dearborn. William P. Erskine
Mar 7 465*

unit. The record file is slanted at an angle convenient for reading, and its pages are designed for inserting and changing any kind of typewritten index matter. The lamp has an opal glass bowl, a reflector and a special shade to protect the reader's eyes, and when its hundred-watt bulb is turned on, the index is flooded with fifty foot-candles of light.

F1333

Night Thermometer Has Radium Numbers

Designed especially for easy reading at night, the latest thermometer has radium-painted numbers and pointer on its face. The instrument is mounted on a swivel for tilting to any convenient position. The case is of baked black enamel and the crystal is unbreakable. The thermometer is guaranteed for commercial accuracy. Installed just outside the window, it may be read in daylight or darkness.

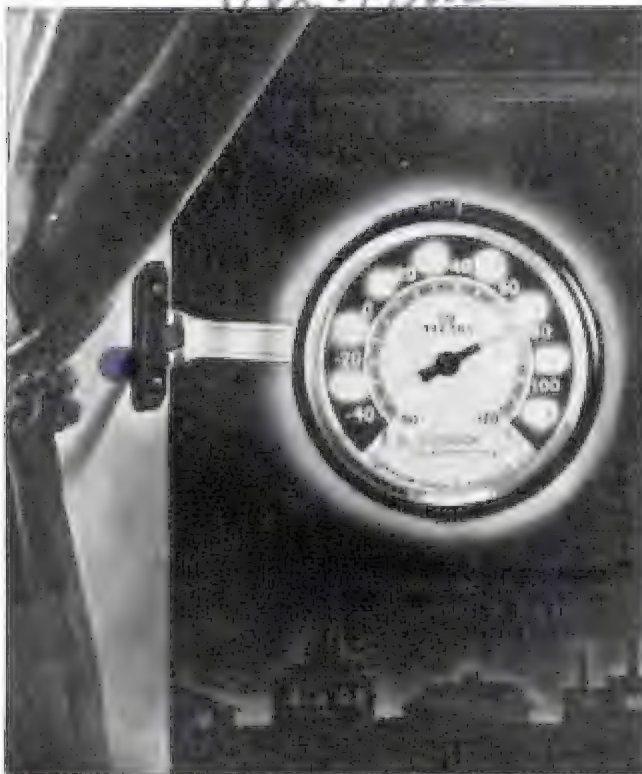


Photo shows radium-dial thermometer attached to outside window frame

Baby Rides in 'Bike' Trailer with a Windshield and Cover



Father pumps the bicycle pedals and braves the weather, but son rides comfortably in a homemade trailer protected by windshield and top

Old bicycle parts were used by an English bicyclist to build a two-wheeled trailer in which his son rides. It is streamlined, and has both windshield and folding top to protect the baby from sun or rain. The homemade bicycle trailer cost less than ten dollars.

Roofing Nail with a Lead Head Is Anchored by Shank Rings

Lead-headed roofing nails which cannot work loose have just been introduced. Built on the principle of the anchor, they have rings around the shank to prevent the nail pulling out or twisting out like a screw. They are especially useful for galvanized roofs.



Of the 250,000 or more plants known to man, only a few hundred are grown agriculturally and only a few score are food plants basic to civilization.

Germanow Dixon
P. 448 H. Paul

Science Monthly
Vol 143, 247

Billiards and Bowling Combined in New Game



Playing the "cue-bowl" game, a standard billiard cue taps a billiard ball down a table alley against small pins, scoring as in ordinary bowling. This alley can be set up in the home recreation room

Billiards and bowling join forces in the latest home game. Ten maple pins are set up as in bowling at the foot of an alley twelve feet eight and one-half inches long. Instead of rolling a big ball, the player taps a standard two and one-quarter inch black billiard ball with a standard billiard cue, and scores as in bowling. The

alley, sturdy enough to support 1,000 pounds weight, is built to the scale of the bowling alley, being twenty-two inches wide and mounted three and one-half feet high. As many as ten persons can play. A built-in templet makes pin adjustments a matter of seconds, and the balls are automatically returned as in bowling.

Glass Brain Is Used to Show How Human Brain Works



Demonstrating the glass brain

Capable of performing all the functions of the brain except think, a glass brain perfected by Dr. Temple Fay shows how a human brain works. It was demonstrated before the American College of Surgeons.

Sensitive Paint Indicates Water Present in Gasoline Tank

Red paint which is sensitive to water is being used in testing gasoline tanks for their water content. The red coating is applied to one side of the measuring stick used to sound the tank. When it is dry, the stick is lowered to the bottom of the tank and then removed ten seconds later.

If there is water in the tank it will turn the red paint a chalky white. When the stick dries, the paint becomes red again and the same coating can be employed several times for the water test before it is necessary to repaint.

Auto Parking Meters Tested by Artificial Weather

Severe tests of automobile parking meters designed for installation at the street curbing are conducted in a Minnesota city by creating artificial weather, dust and rain storms, heat and cold waves. The meters, made by competing companies, are placed in a hot oven until the heat reaches 120 degrees. Then they are transferred to an ice-cream manufacturer's refrigerator where the temperature is ten degrees below zero. To duplicate dust-storm conditions the meters are sand-blasted. Finally rain-making apparatus, consisting of a perforated pipe through which water is forced under pressure, is set up and "rain" falls on the meters, simulating a four-inch rainfall. At fifteen-minute intervals the meters are given a quarter turn so that the water may strike the instruments at different angles, thus revealing flaws. Meters which withstand these tests are selected to control parking on city streets. Upon dropping a coin into the meter, the motorist may park his car for a certain period without interference.



Rain-testing the parking meters before they are placed in service on city streets

Official Baker Tests Bread for Looks and Texture



Inspecting loaves of bread baked in government ovens for experimental and grading purposes

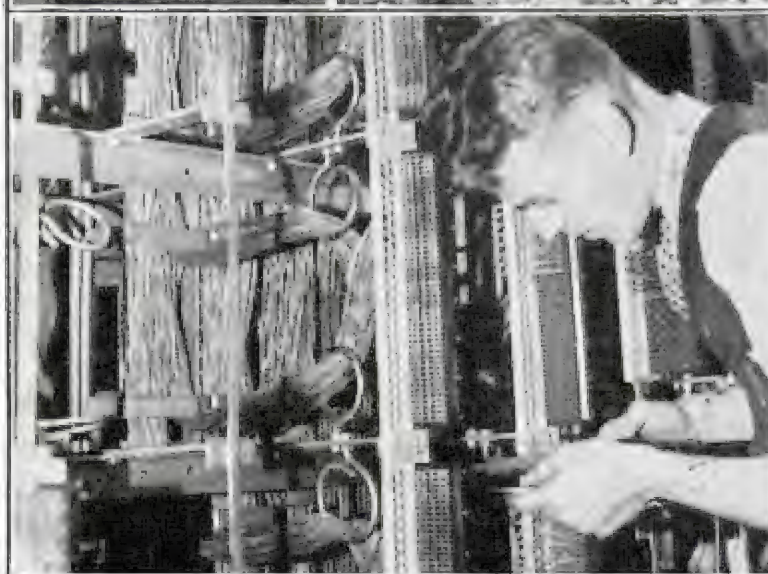
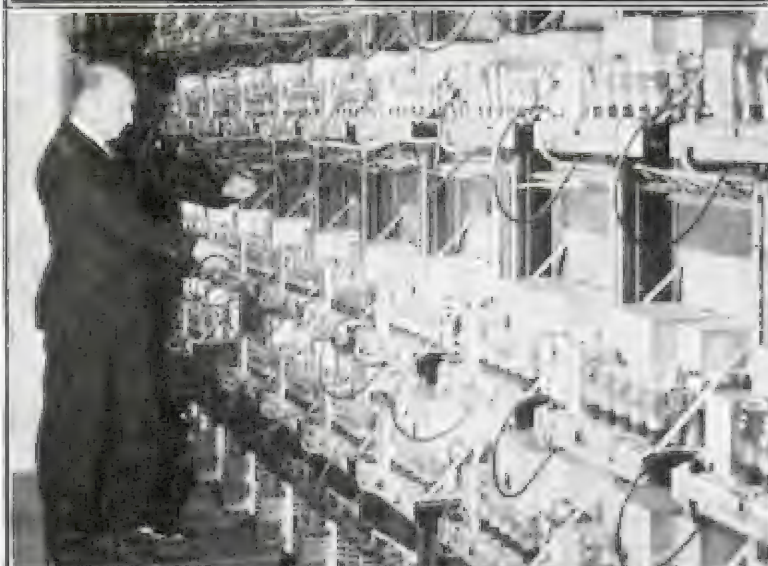
Baker for the sake of science, Lorin H. Bailey for twenty years has been turning out cakes and cookies, biscuits and pies and bread in the laboratory of the Bureau of Chemistry and Soils in the Department of Agriculture. He grades every loaf of bread carefully, allotting thirty per cent for external appearance, evenness and color of crust, symmetry and volume; seventy per cent for internal texture. Results of his baking experiments are reported in papers that become guidebooks to bakers throughout the country. In making bread, Mr. Bailey weighs ingredients and places them in an electric mixer. Then the dough goes into a glass-enclosed "proofing cabinet" where the yeast ferments, the temperature being kept at eighty-six degrees and humidity at seventy-five. Next he kneads the dough—he calls it "punching"—and replaces it in the cabinet, and after repeating this process several times the dough is baked at 450 degrees.

Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information, inclosing return postage.

Washington, D. C.

Minneapolis office

The MASTER MAN



Top, left, engineer of the power supply board in Radio City. Right, broadcasting over the 100-watt "cue channel" which is used for communicating with the portable auto-truck transmitting stations. Center, amplifiers used for the many loudspeakers scattered throughout the N.B.C. offices. Bottom, part of the maze of wires behind the master control board

IN a little niche of Radio City is a man who holds every program emanating from there in the palm of his hand.

He bosses two great radio networks and makes his headquarters at the central desk of the master control board in the world's greatest broadcasting center. Here are the heart, brains, and nerve centers of a great radio system, all manipulated by thin strands of wire through which speed electric pulsations that make possible the wonders of network broadcasting.

The boss of N.B.C.'s Red and Blue network sits at the center of a board twenty-seven feet long, the most flexible and elaborate bit of telltale mechanism that has ever been set up. Telephones, telegraph, teletype, loudspeakers, buzzers, bells, and 3,700 colored light signals are attached to the master control board. In effect, the master control room is nothing more than a signal station from which one man can control the

of RADIO



operations of two great radio networks and a big broadcasting center. He corresponds to the railroad dispatcher; but instead of utilizing "tracks," the master control supervisor utilizes "channels." He gives the final check to each radio program before it is fed to the long-distance telephone lines that carry it from coast to coast.

The control board makes known to the supervisor at a glance what is taking place at dozens of strategic points. There is a constant change of colored lights, a ringing of bells and chimes, a drone of buzzers, and a cross-talk of loudspeakers, an army of invisible lightning-speed "messengers" rushing to and fro, conveying last-minute news to the master control board. If the supervisor had to depend upon human messengers to carry this same information, the direction of network programs would involve thousands of people.

As he pauses for a moment, the super-



Switchbank operator, above, changing studio channel hook up. Below, making "spot news" announcement

visor meditates over a flash that has just been telephoned from Delaware.

"Three hundred men are reported at sea in fishing boats off the Delaware coast," reads the message.

The weather bureau had posted warnings about a tropical hurricane that was



Studio engineer at controls during rehearsal of air program. Below, lead-coated cables laid beneath the floor connect control room with broadcasting studios throughout Radio City

running a high fever while speeding up the Atlantic coast and overtaking shipping that had failed to head for home. The coast guard was standing by. The supervisor opens communication with a dozen different places. Broadcasting does not wait for a disaster; it anticipates emergencies. The Washington office of N.B.C.

dispatches a crew of men to a possible trouble spot in Chesapeake bay; a portable broadcasting outfit is rushed to the Delaware coast. Arrangements are made with local "ham" operators to stand by in case telegraph and telephone lines are disabled.

Fifteen minutes elapse. No word about the 300 fishermen tossing in a mad sea. The supervisor 'phones N.B.C.'s regional offices. Still no news. He solicits information up and down the coast on the teletype machine, meanwhile keeping an eagle eye on the traffic control of regular radio programs. At length, comes a flash.

"Fishermen just pulled off boats by coast guard," it says.

"I was getting worried for a while," the supervisor confessed.

The technique of broadcasting a flash news announcement without the waste of precious seconds is a development but a few months old. The most recent installation on the master control board is a "news flash" control panel. This is essentially an operating link between N.B.C.'s chief announcer and the master control room. If an important news flash arrives in the course of a scheduled program, the spot news announcement does not wait the completion of that program; with a single movement of his wrist, the chief announcer can cut in on a network program and make his brief announcement. Nobody in the studio knows the scheduled

program is temporarily off the air. No sooner is the news flashed, than the chief announcer fades the scheduled program back into its proper channel. Thus, nobody in the studio is disturbed by what has taken place. The "news flash" panel saves much running back and forth between the master control room and the chief announcer's station.

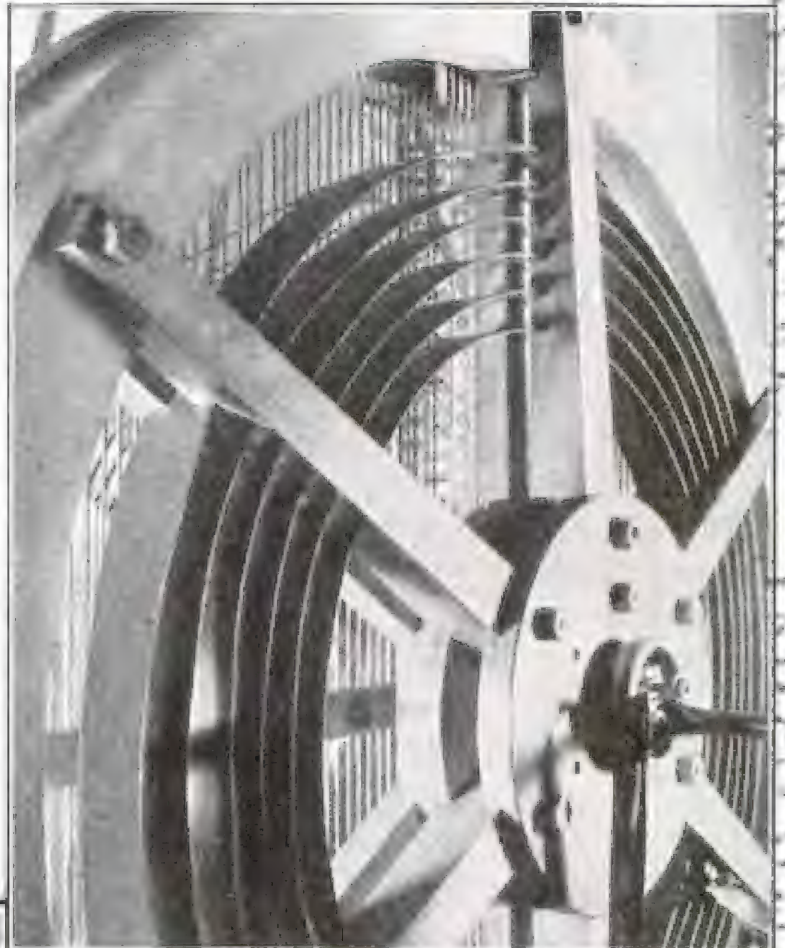
A novel method is also used for picking up a program from a distant point. If Los Angeles is scheduled to feed the network for an eight o'clock program, the master control supervisor notifies the telephone operator by teletype.

"Please connect me with LA585 at 7:56 p. m.," says his message.

At 7:56 p.m. the operator's bell rings.

"Ready with LA585."

"Go ahead, please."



Top, part of transmitting apparatus. Center, master control board. Left, supervisor of control board at central position

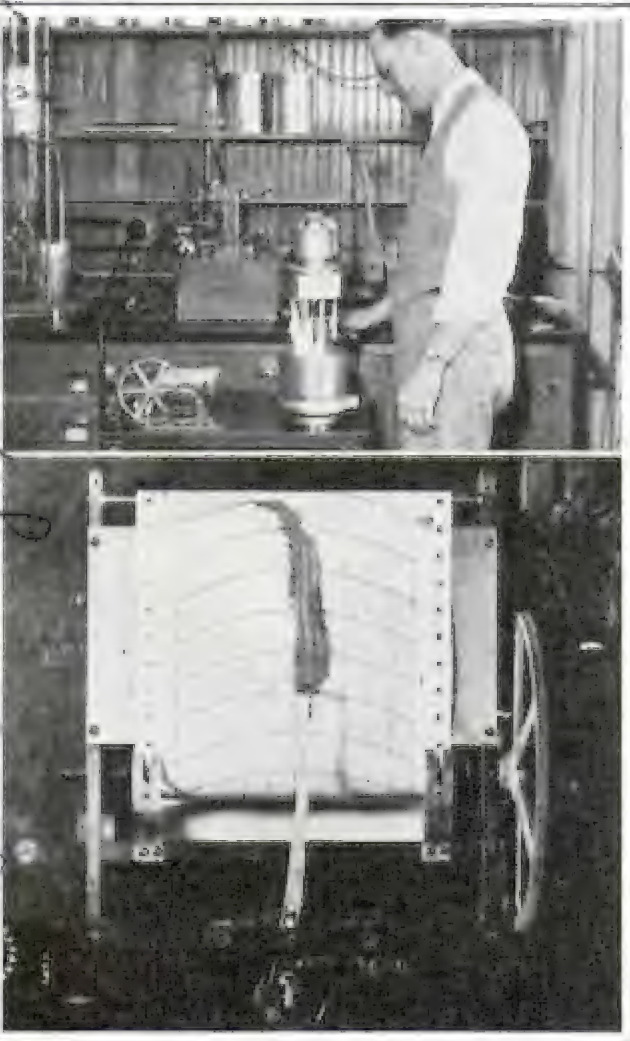
If Los Angeles was not on the previous network program and, hence, has not heard Radio City's chimes, the master control supervisor "cues" the distant station with a teletype signal, "gagagaga..." which means "go ahead."

Since modern broadcasting is virtually on a twenty-four hour basis, the supervision of the master control board is carried on by three watches, two or three men on

(Continued to page 136A)

F1370

Flour Is Given a Written Test on Recording Dough-Mixer



Top, testing dough made from a sample of flour.
Below, the record written on the graph

Mixing bread dough has been reduced to an exact science, all the guesswork and experiment over proper time and proper flour obviated. The dough is made to analyze itself on a graphic record. From this record the baker can tell exactly how long dough should be left in the mixer, and whether the flour being tested has adaptability and stability for making good bread. The ingredients are placed in a small aluminum mixing bowl in the bottom of which are four stationary steel fingers. Over the bowl is placed a mixing head with four rotating fingers, and as the head itself revolves these fingers move around the stationary ones. As the mixing proceeds, the slightest movement of the aluminum bowl is transmitted to a delicate balance arm; a rod leading down from the bowl to a horizontal bar transmits the pressure exerted on the bowl by the moving dough, and a pen draws a

F1401

Valve Stops Flow of Gasoline When Auto Tank Is Full

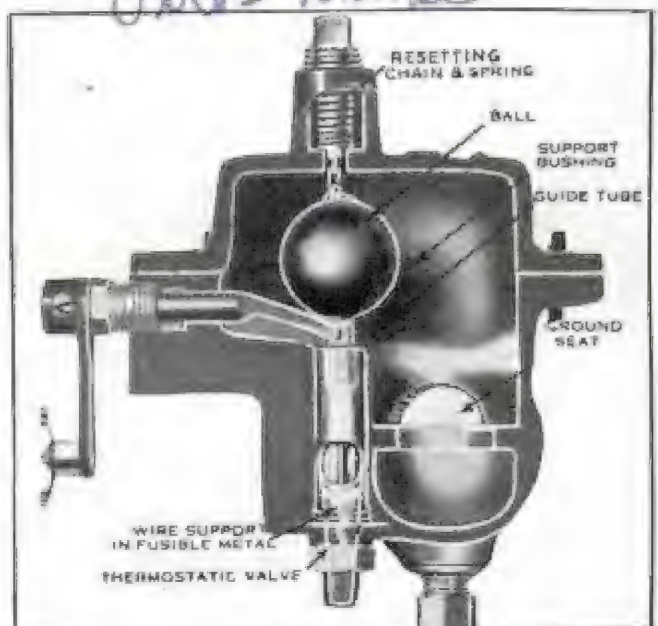
Designed to automatically cut off the flow of gasoline when the automobile tank is full, a sensitive valve for filling-station hose prevents overflow. The valve shuts off when the gasoline reaches the end of the nozzle, operating by suction. It also may be used in handling other liquids.



F1328

Steel Ball Guards Building from Fire and 'Quake

Designed to protect homes and other buildings against fire and against the danger of broken gas lines in earthquakes, a



When the steel ball is dislodged from its seat, gas flow is cut off

American Safety

Inv. Mr. C.C. Swanson and Mr. Carl B. Working
Kansas State College, Manhattan, Kan.
Inventors

new device has been approved by underwriters. A steel ball, perched on a slender column, is unseated either when an earth tremor of a given intensity shakes the ground or when the temperature where the device is located reaches 160 degrees. Toppling of the ball from its place cuts off the gas and sounds an alarm, thus affording fire and earthquake protection. At San Francisco and at Tokyo, the earthquake caused only five per cent of the total damage, fire accounting for the rest.

Trailer Is Pushed by Automobile to Haul Wood

By hitching a trailer in front of his automobile and pushing it onto uncleared land, one man has found a way to speed up wood hauling. It has been found easier to push the trailer and to haul out wood faster by this method than by hitching it to the rear of the car. By using a double hitch, both front and rear, greater ease in maneuvering the trailer is provided.



Auto pushing trailer into the woods

Lifeboat Freed from Ship When It Touches the Water



Showing lifeboat at moment of touching the water. This action causes lowering lines to be released and the boat to float free.

When lifeboats from the modern liner touch the surface of the water, they may be automatically released from the ship by a device tested recently in New York. The device is designed for safety, to prevent swamping and overturning of lifeboats entangled in the gear by which they are lowered. In marine disasters, many lives have been lost because the lifeboats could not be released from the ship, due to the tangling of lines or failure of the crew to operate the gear properly.

¶ Dogs trained as companions for the blind are treated as human passengers on the Baltimore and Ohio railroad. They are the first dogs permitted in passenger cars.

Edman Overland

Railway Age

Old Coaches Moved by Truck to Lunch-Stand Sites



Here is how old railroad coaches are hauled away by purchasers to be used as lunch stands and sometimes as homes

Old wooden railway coaches, sold to be wrecked or to be used as lunch stands or even homes, are moved to their purchasers' sites by truck. The coach is set upon rubber-tired wheels and hauled away by the powerful engine mounted in the forward end of the truck. The wooden equipment is sold to make way for steel coaches.

Atom Smasher May Give Secret of Structure of Matter

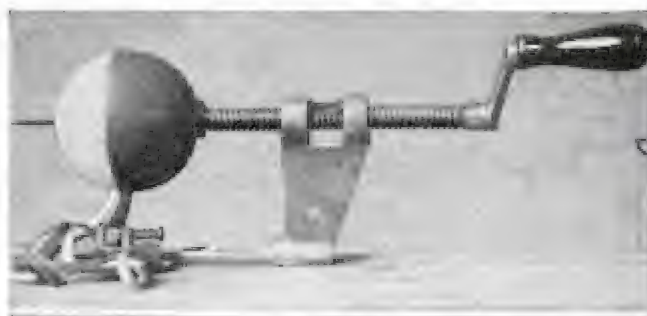
Some of the mystery surrounding the structure of matter may be revealed by a powerful atom smasher with whose aid research engineers of the Westinghouse Electric and Manufacturing company expect to embark on a scientific journey into the unknown. Since it is recognized that the application of steady high voltages is necessary to provide information in the field of nuclear research beyond that already revealed, an electrostatic generator offering direct-current potentials of 5,000,000 volts is now being designed to attain the high velocities necessary for atomic bombardment. It is hoped eventually to go beyond that peak. Little is known about such high direct-current voltages because nearly all previous research has been in the field of alternating current high voltage. The apparatus contemplated for the generation of such high direct-current voltage includes a pear-shaped

vessel thirty feet in diameter and forty-seven feet long, built for air pressures of 150 pounds per square inch. The project involves the building of apparatus to withstand the high voltages sought; the designing of units to withstand terrific air pressures and high degrees of vacuum and the development of a vacuum tube, in which the atomic bombardment will take place, capable of withstanding voltages of 5,000,000 or more. This is the first time that a large industrial concern has entered the field of atomic research and, while no one can foresee the ultimate results, it is pointed out that most fundamental knowledge gained by science is put to some practical use. Thus, when science learned to control electrons, the radio in-

dustry was developed; and knowledge about control of electron streams made it possible to develop circuit breakers capable of interrupting high voltage as easily as turning off the water in a kitchen faucet. Science previously has found a way to strip off the electrons that surround the particles of matter, leaving only the nucleus or core of the atom. In it may be hidden other nuggets of pure scientific gold waiting to be mined if a way can be found to their hiding place.

Simple Orange Peeler Speeds Preparation of Fruit

Simple in construction and automatic in operation, an inexpensive orange peeler has been invented. It has three main parts and one spring. The device can peel six oranges per minute, the work being done by a knife with two cutting edges.



Turning the handle causes this device to strip the skin from an orange quickly

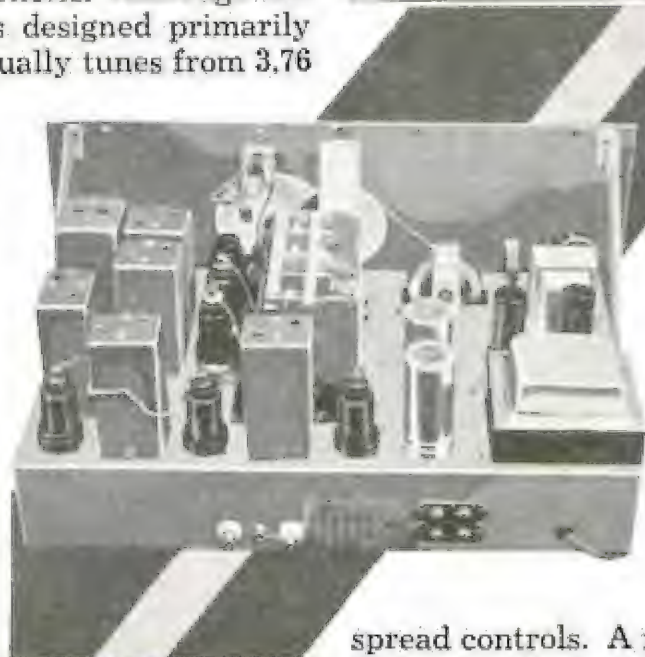
Radio



ULTRA S-W RECEIVER HAS BUILT-IN Noise Silencer

INCREASING interest in the 5 and 10-meter bands has encouraged radio engineers to develop special receivers for these ultrahigh frequencies. Although the receiver illustrated is designed primarily for these bands, it actually tunes from 3.76 to 53 meters. This range, of course, also covers the amateur 20 and 40-meter bands as well as the 19 and 49-meter foreign broadcasts.

Ultramodern as well as ultra short-wave, it includes a built-in Lamb noise silencer which brings the background noise level to a new low. There



are a number of controls on the front panel as will be noted in the upper photo. These controls are necessary for tone, audio gain, R.F. gain, noise silencer, band switch, crystal phasing condenser, I. F. expander, crystal switch, AVC switch, "send" and "receive" switch, main tuning and band-

spread controls. A rear view of the chassis is given in the center photo. Provision has been made for a 5,000-ohm speaker, and either a doublet or regular single lead-in antenna. Headphones may be plugged into a jack connected in the first audio stage. This jack is so arranged that the speaker is shorted out when the headphones are being used.

The following metal tubes are employed in the circuit: 6K7, R.F. amplifier; 6C5 oscillator; 6L7, first detector; 6K6 first I.F.; 6L7, second I.F.; 6J7, noise silencer amplifier; 6Q7, noise silencer and first audio; 6R7, second detector and beat oscillator; 6F6, power amplifier and a 5Z4 rectifier.

The lower photo shows the receiver in operation in the shielded testing room of Popular Mechanics radio laboratory.



HOW *to* BUILD a

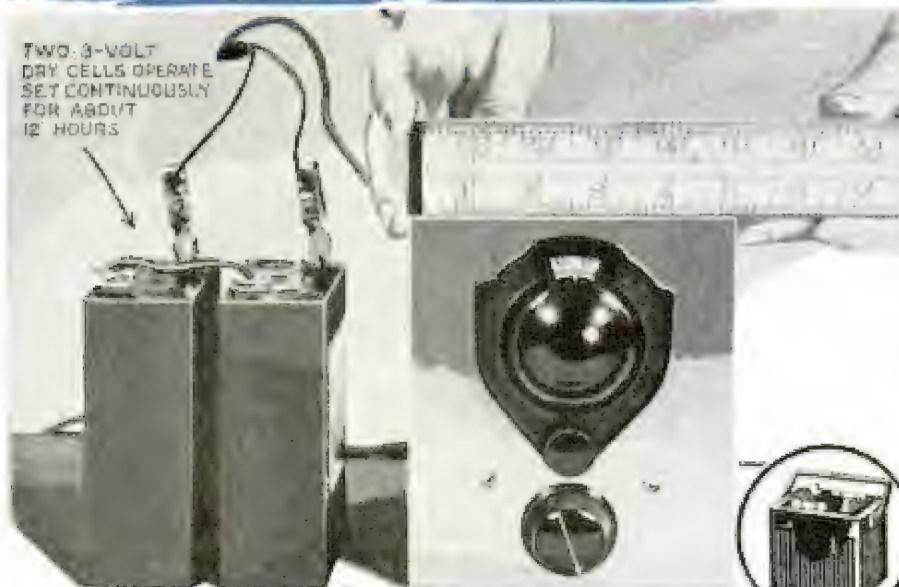


Fig. 1



FIG. 2-A

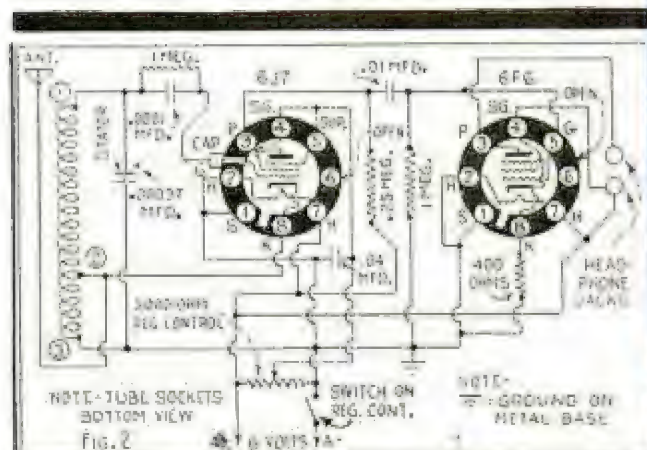


Fig. 2

ONLY a handful of inexpensive parts is required to build this little ultracompact broadcast receiver which is designed to work from a single d.c. source. No B-batteries, power pack, transformers, dynamotor, rectifiers or other expensive parts are necessary for its operation.

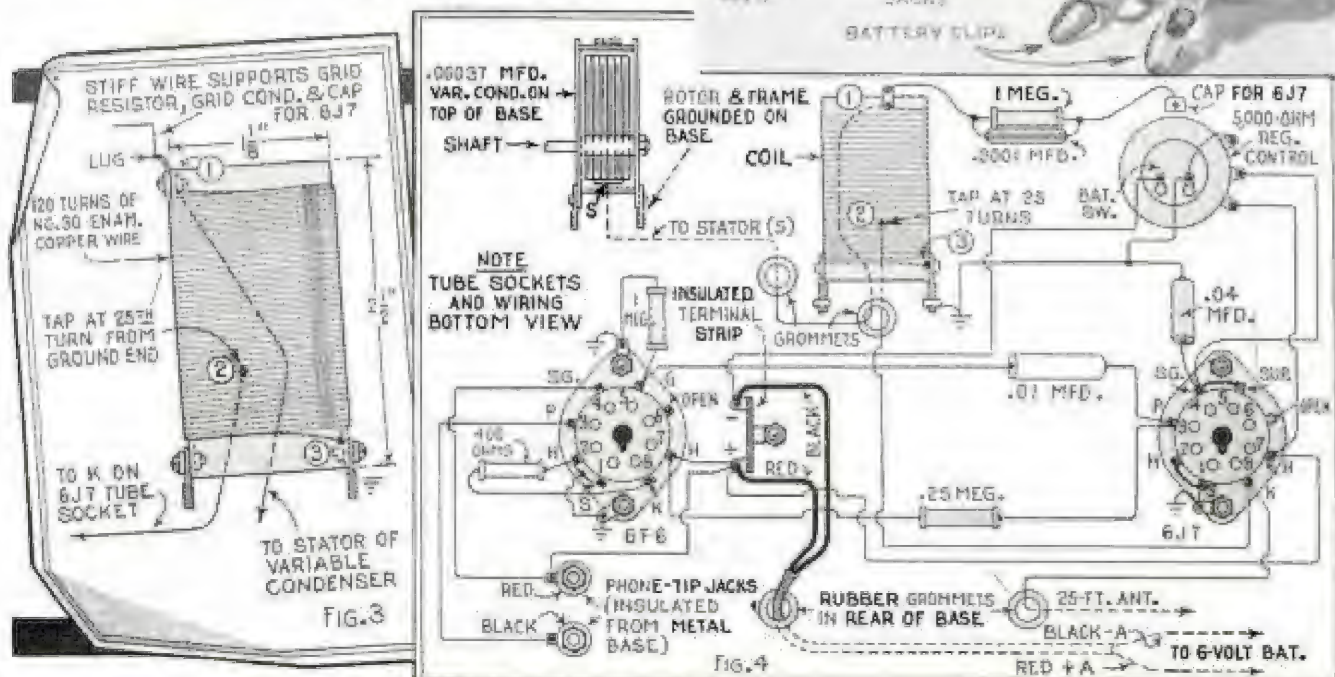
The primary idea behind the design is to provide a simple, rugged portable receiver that will work from a 6-volt storage battery, or a few dry cells, when other sources of power fail. When floods, hurricanes or other natural catastrophes occur and all ordinary means of communication go out, it is satisfying, and sometimes vitally important, to be able to learn from outside radio stations just what is going on. As a portable knockabout set, it also has other useful applications in the home, boat or camp.



RECEIVER

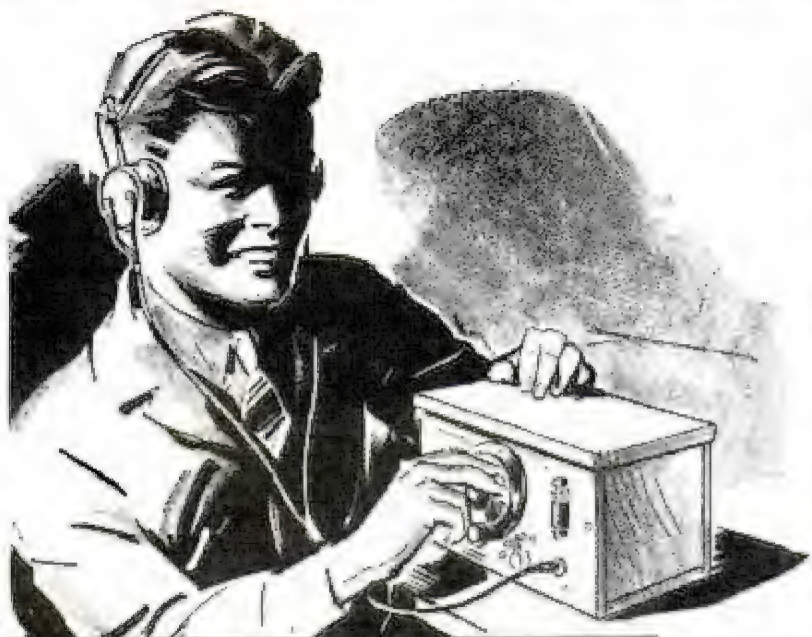
Non-critical antenna coupling permits the use of various lengths of antenna without seriously affecting the tuning of

(Continued to page 152A)



Crystal Receiver Built from Junk-Box Parts

By Arthur Wildhagen



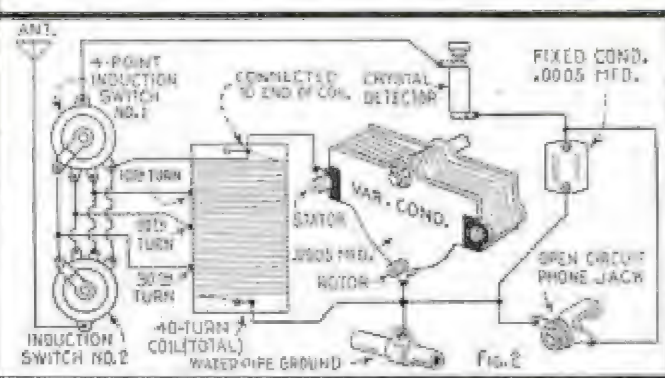
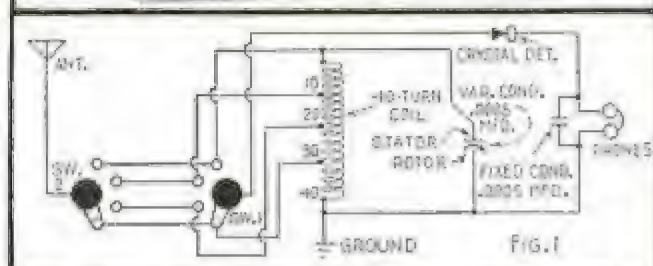
ALTHOUGH built from odds and ends commonly found in the average experimenter's junk box, this is a practical crystal receiver that will do everything that any well-designed crystal set should do. It is selective enough to separate most of the powerful broadcasting stations in metropolitan areas, bringing in local programs with the excellent clarity characteristic of a good crystal detector.

It is housed in a homemade wooden cabinet 10½ in. long, 7¾ in. deep and 7½ in. high, and looks

something like a regular tube-type receiver. The coil is wound on a cardboard tube 4 in. in diameter and 5 in. long. It consists of 40 turns of ordinary insulated bell wire close-wound in a single layer and tapped at the 10th, 20th and 30th turns as shown in Figs. 1 and 2. The beginning and ending coil leads are anchored through holes punched in the cardboard form and are left long enough to reach the terminals of the variable condenser. This condenser is an ordinary 23-plate type commonly used in older models of standard receivers.

The 4-point induction switches, crystal detector and phone jack are mounted on the plywood front panel which is ¼ by 7½ by 10½ in. Regular 4-point inductance switches may be used, or the cheaper switch levers and contact points as shown in the front view of the completed set, Fig. 2-A. The contact points and stops cost about 10 cents a dozen; they are inserted through holes drilled in the panel

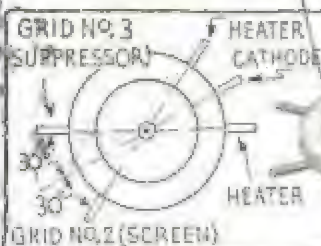
(Continued to page 148A)



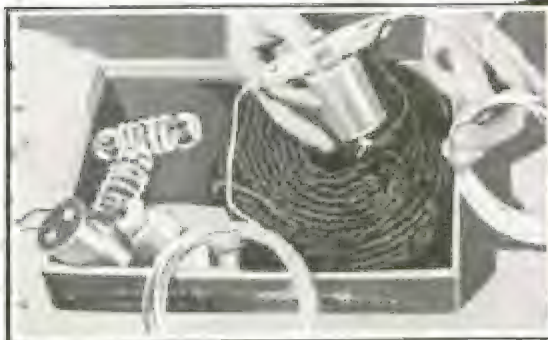
Helpful RADIO HINTS

Right, spare tubes inserted in sockets on narrow wood or Bakelite shelf mounted inside radio console. Sockets are provided so that a spare for each type of tube in the set is available for immediate replacement. A chart showing when each tube was last changed is posted under the shelf for convenient reference.

Below, acorn-type super-control r.f. amplifier pentode. A companion tube to acorn 954 and 955.



Below, noise-reducing self-selecting all-wave antenna kit, wired and soldered ready for installation wherever a 60-ft. span is available.



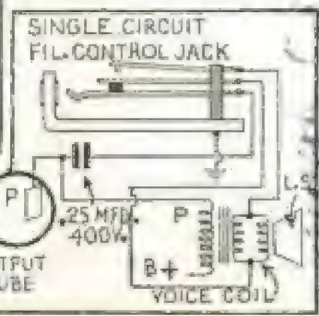
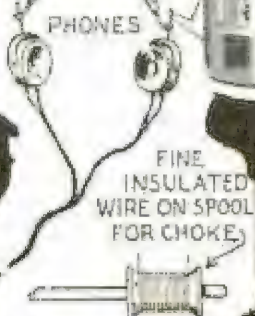
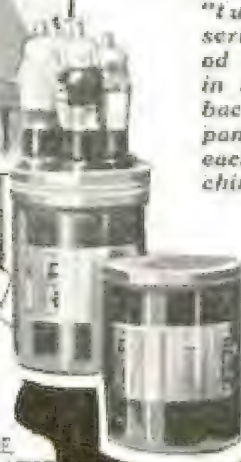
Headphone trouble shooter locates auto-ignition noises and sources of man-made static near home receiver. Choke on stick is wound with 100 turns No. 30 enamel wire.



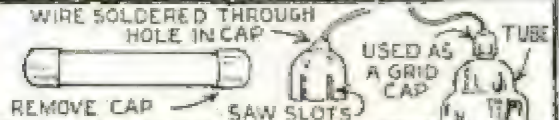
EXPLORING COIL
WALL
LOCATING INTERFERENCE



Left, two coffee cans with "twist-lock" tops provide service men with a safe method for carrying spare tubes in a car. Covers are placed back to back and four top-of-panel sockets are mounted on each side by means of machine screws. Photo shows completed assembly.



Jack for using headphones with any set. Closed-circuit "filament control" contacts short out voice coil in speaker when phone plug is inserted. Below, control grid cap made from end of old amperite or burned-out resistor.

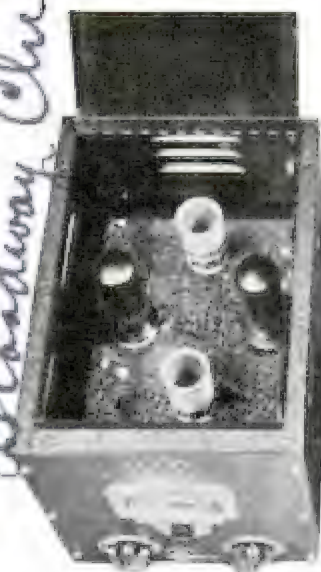


Rotary Clock Gives World Time



When it's 10:00 a.m. in Chicago, New York or San Francisco, what time is it in Berlin, Hawaii or the Azores? This clock-globe gives you the answers on a 24-hour rotary time band.

Amateur Frequency Control Unit

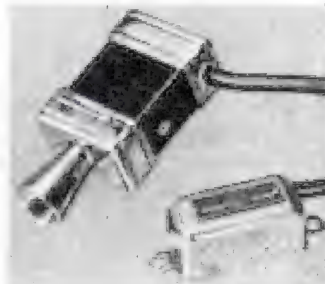


When properly monitored, this electron-coupled oscillator unit offers a convenient method for remotely controlling the frequency of an amateur transmitter from the operating position. Powered with a separate unit, it will excite a low-power stage such as RK-20, 802, 210

or equivalent tubes, directly. By means of a band-spread control, the operator can shift frequency within reasonable limits to a point of minimum interference.

Special Purpose Crystal "Mikes"

Designed for sound and vibration pick-up, the small contact-type unit at lower right is used to study machine problems; it is also suitable for stringed musical instrument reproduction. The larger unit is a piezo-electric crystal device for picking up heart and chest sounds for reproduction and recording.



Car Antenna Easily Installed



Mounted on rubber vacuum-cup stand-off insulators to avoid drilling holes, this car-top antenna consists of a length of aluminum tubing which is easily bent to conform with the streamlined tops of modern coupes and sedans. It is intended principally for all-steel turret-top cars.

Blueprints covering radio construction articles in past issues are available for 25 cents each; original material lists and additional information can be obtained from our Radio Department without charge upon receipt of postage.

NEXT MONTH—How to Build the 1937 Little Giant Portable A.C.-D.C. Receiver. The improved model of this popular a.c.-d.c. midget set tunes from 70 to 550 meters, has twice the volume of the original, uses new tubes and is easier to build. Also **Phono-Oscillator**, for playing records through any receiver.



Electric PEN and PENCIL

to write and draw on sheet metal

by Byron M. Taylor

AS THIS electric pencil utilizes an electric arc to burn inscriptions into metal, it is practical for marking tools. It is made of standard-size fiber, copper tubing and iron rod. The bulk of the weight and the heat from the winding are above the hand as in Fig. 1. The electrode may be lengthened as it burns down by pulling it out of the copper tubing.

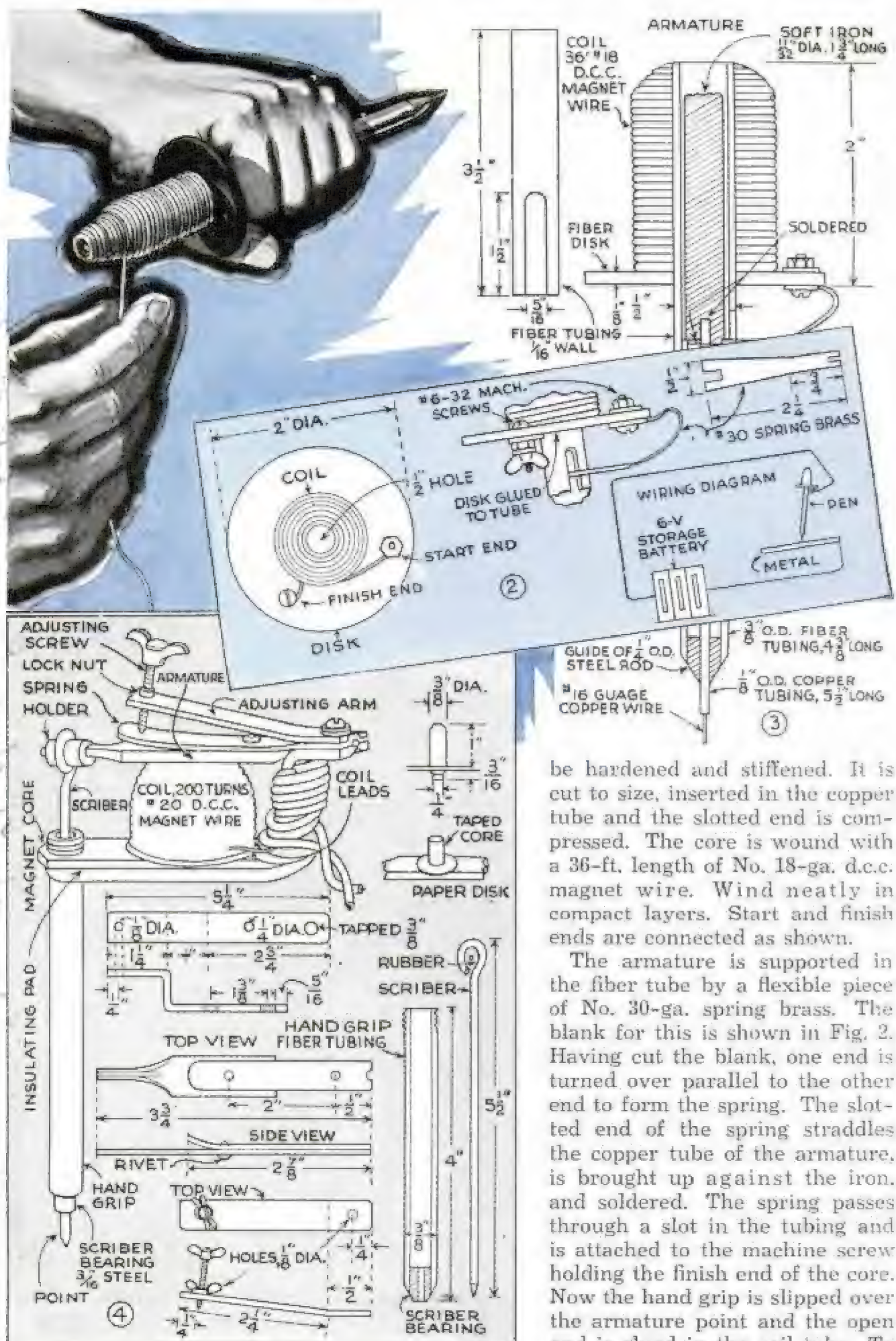
A ½-in. fiber tube (see detail of Fig. 2) is slotted and fitted with a fiber disk. The outside of the tube is roughened just above the slot and the disk glued on. A second fiber tube, 4¾ in. long, is fitted with a ¼-in. steel rod, ¾ in. long, drilled to receive a ⅛-in. tube. The rod is glued in place at the end of the tube after which both are ground to a point.

Now the armature, electrode and core: The former is a piece of soft iron with a ⅛-in. hole drilled in one end to receive a ⅛-in. copper tube, 5½ in. long, which is soldered in place. The other end of the tube has a slit, ¼ in. long, so the tube can be slightly pinched to hold the electrode, No. 16-ga. copper wire. One end is locked in a vise and the other in a hand drill, after which the wire is pulled while turning the drill so that the wire will

①



Underway 12
 7 E. 44th Street
 Wash Electric Co.
 Electric pen-
 121st St
 P.O. Box 110



be hardened and stiffened. It is cut to size, inserted in the copper tube and the slotted end is compressed. The core is wound with a 36-ft. length of No. 18-ga. d.c.c. magnet wire. Wind neatly in compact layers. Start and finish ends are connected as shown.

The armature is supported in the fiber tube by a flexible piece of No. 30-ga. spring brass. The blank for this is shown in Fig. 2. Having cut the blank, one end is turned over parallel to the other end to form the spring. The slotted end of the spring straddles the copper tube of the armature, is brought up against the iron, and soldered. The spring passes through a slot in the tubing and is attached to the machine screw holding the finish end of the core. Now the hand grip is slipped over the armature point and the open end is glued in the coil tube. To

operate, wires are connected as shown in the wiring diagram, using either a 6-volt storage battery or a 6 to 8-volt transformer of not less than 50 watts. When you press the pencil electrode lightly on the work a series of arcs will result.

The engraving pen, which has a vibrating scriber, is detailed in Fig. 4. The frame, which supports the armature and coil, is a piece of $\frac{1}{8}$ by $\frac{3}{4}$ by $5\frac{1}{4}$ -in. flat iron, bent and drilled as shown. The $\frac{3}{8}$ -in. hole is tapped for the fiber-tube hand grip. The $\frac{3}{8}$ by $1\frac{1}{16}$ -in. core for the coil is filed or turned at one end to fit the $\frac{1}{4}$ -in. hole in the frame. The projecting end is peened over. Before winding the coil, a disk of thick, oiled paper or thin fiber is slipped over the core, after which the latter is wrapped with friction tape. The completed coil is covered with a single wrapping of tape and is then thoroughly tested to make sure that it is not grounded to the frame.

The vibrating armature is made from a piece of $\frac{1}{8}$ by $\frac{1}{2}$ -in. flat iron to which a piece of old hacksaw blade is riveted. Top and side views of the armature are detailed in Fig. 4. Note how one end is tapered to take a rubber sleeve on which the end of the scriber is fastened. Both the extending end of the hacksaw blade on the armature and the adjustment arm of $\frac{1}{8}$ -in. metal are held by a machine screw to the frame, a thumbscrew being used to control the up-and-down movement of the armature.

The fiber-tube hand grip is threaded at one end to screw into the frame. The other end is fitted with a bearing for the scriber, similar to the one in Fig. 3. The scriber is formed from a 7-in. length of $\frac{1}{8}$ -in. drill rod. The eye at one end fits a rubber bushing on the armature. The other end of the rod is pointed. When assembled, the scriber should move freely in the bearing at the lower end. The armature spring, the adjusting arm and the frame are each indented with a cold chisel so that the two top pieces will not shift. Solder a length of lampcord to the coil ends and tape well. When the line wires are connected to a 50-watt, 6 or 8-volt transformer and the proper spring adjustment is made, there should be a strong and steady vibration of the scriber point. Some variation in adjustment will be necessary.

Sheet-Metal Disks and Washers Quickly Cut in a Lathe



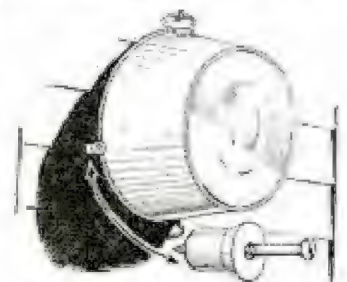
Disks and washers of light sheet metal are easily turned out in quantities with this tool

It's a simple matter to cut small disks from light sheet metal in a lathe with this tool. A block upon which the metal is mounted is backed up by a wood pad on the tailstock, and the shank of the cutting tool is held in the chuck. The tool may be made in one part if only one size of disk or washer is to be cut. Or, it may consist of an externally threaded shank to receive internally threaded cutters of various sizes. Sawing off the end of the tool obliquely and grinding this surface, after hardening, produces a sharp working point.

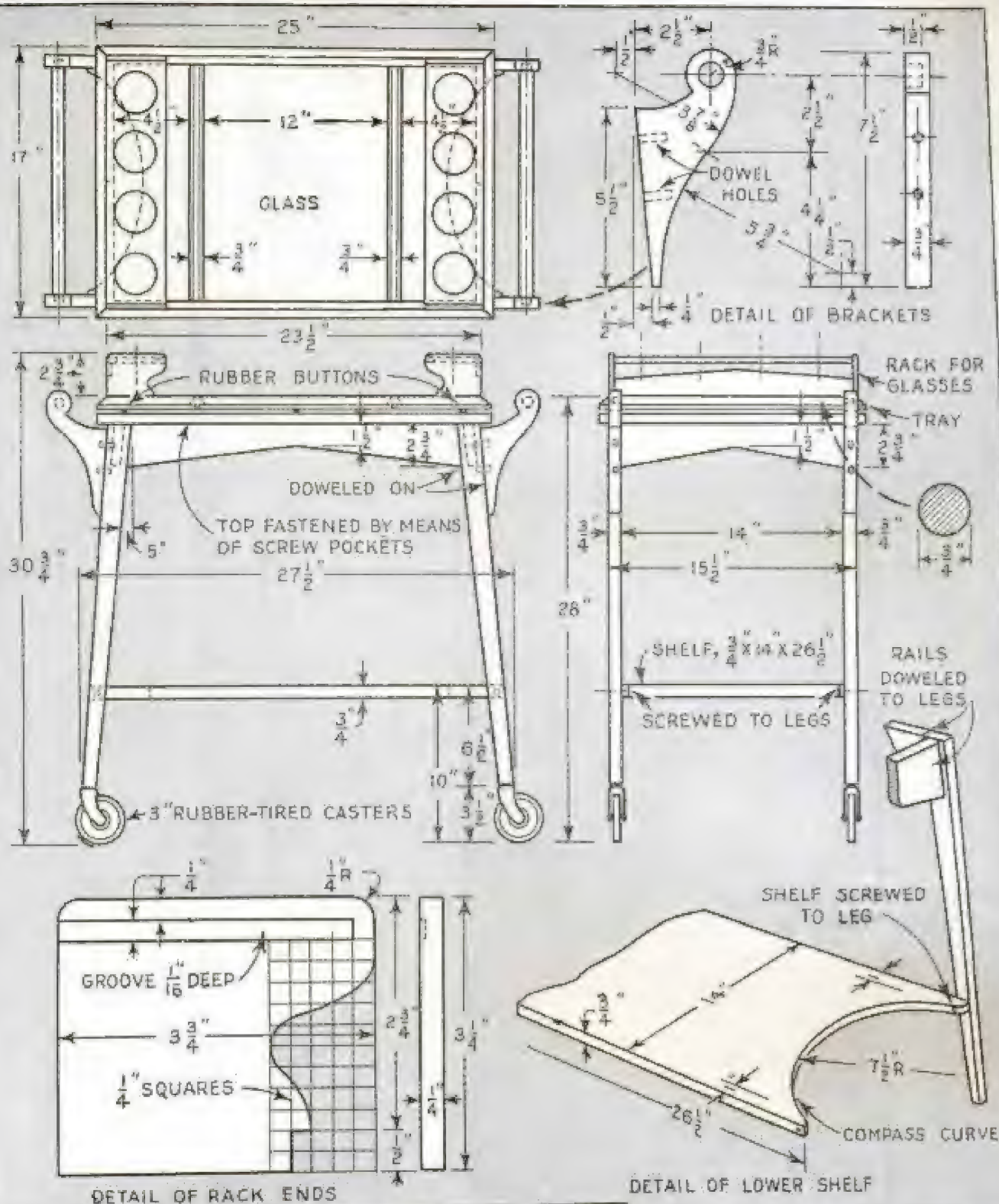
—John E. Hyler, Peoria, Ill.

Wash Tubs Held Snugly on Wall

If you hang your wash tub on the exterior wall of an outbuilding and it "bangs around" in the wind, a couple of empty thread spools will quiet it. One end of each spool is cut off and they are screwed to the wall on each side of the tub.



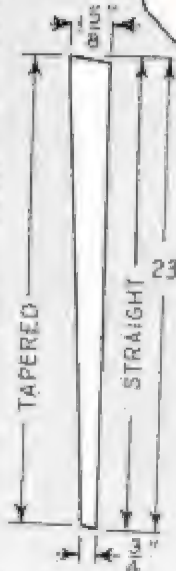
Step-Saving TEA and



Styled for simplicity of line and easy construction, this beverage cart has a glass-bottom tray fitted with racks for holding a refreshment set. Due to the small size of most of the parts you'll find it economical to build this project of selected solid wood. If you study the joinery closely you will see that the whole job can be done with hand tools

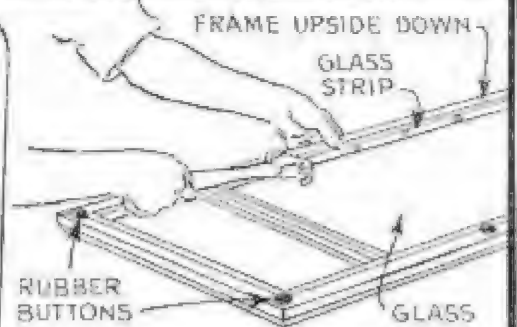
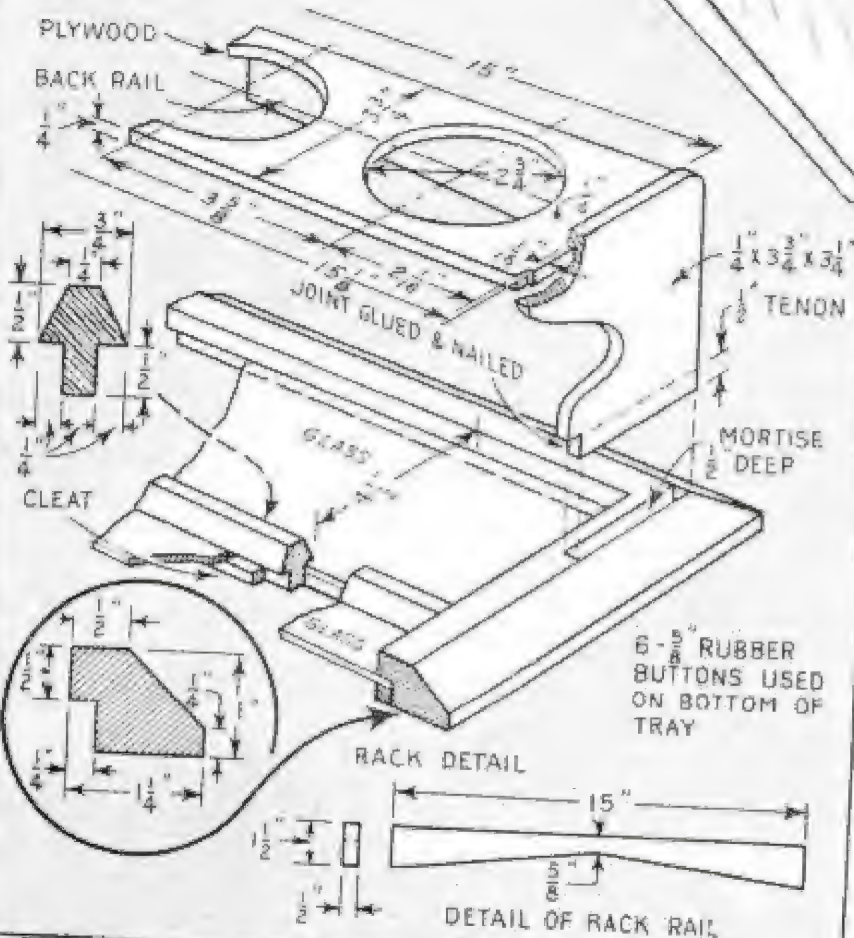
POPULAR MECHANICS

BEVERAGE CART

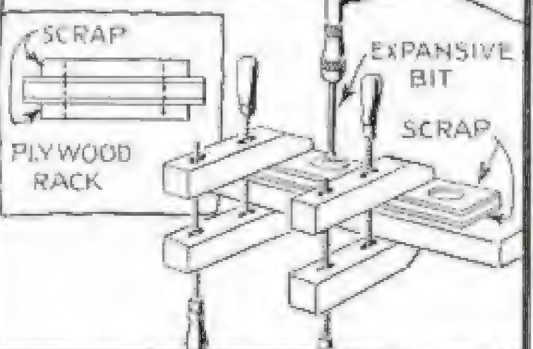
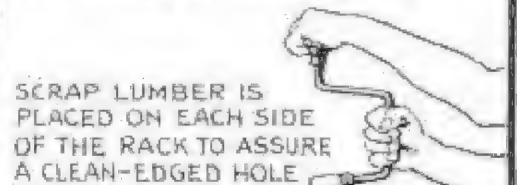


USE WALNUT, MAPLE
OR MAHOGANY

LEG DETAIL



GLASS IS FASTENED IN THE FRAME
BY MEANS OF GLASS STRIPS



SHEET NO. 1

ISSUE

POPULAR MECHANICS MAGAZINE
200 E. ONTARIO ST CHICAGO

BLUEPRINT No. SN 959

Wood-Turning Chisels Stored in Pockets under Lathe



Turning chisels stored in these pockets are not likely to be damaged and are always at hand

Tacked to the underside of the bench or table supporting a wood lathe, a strip of canvas 5 or 6 in. wide, divided into a series of pockets with wood cleats, as shown, provides a handy place to store your wood chisels. They are always at hand when needed and there is little possibility of them getting dulled or nicked.

—L. C. Ferguson, Manteca, Calif.

Cutting Mimeograph Stencils to Get Heavy Printing



If you want to print heavy, black lettering with a mimeograph machine, cut the stencil over a piece of coarse silk instead of the usual fine screen wire. By rubbing over the area to be shaded with the

point of a loop stylus, much of the stencil coating will be absorbed by the silk without injury to the gauze or tissue which

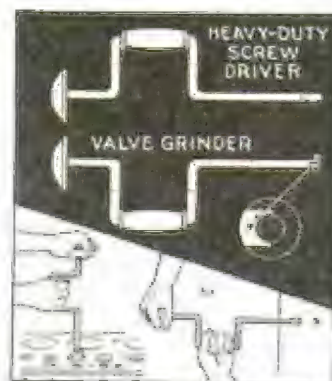
forms the foundation of the stencil. Thus, when placed on the machine, the ink will come through this treated portion more freely, producing a heavy black tone. Stencils treated in this manner must be handled carefully, and will not stand up under long runs.

Screwdrivers and Valve Grinders from Old Speed Wrenches

Old speed wrenches with broken sockets are readily converted to a screwdriver or a valve grinder.

The latter is made by sawing off the socket, slotting the end of the wrench to take the tip, which is pivoted in place with a cotter key. The tip is made from a steel washer as shown. In making a screwdriver, the end of the wrench is merely ground to shape and hardened.

—Robert E. Davy, Represa, Calif.



Paraffin Scraps Molded into Cakes

Scrap pieces of paraffin, left over after a job of fruit preserving, may be molded easily into cakes and stored for future use.



Just melt the scraps and pour the liquid into a rubber soap tray, first cooling the tray in water and wiping it dry. When the paraffin hardens, the tray may be bent as shown to release the cake. While

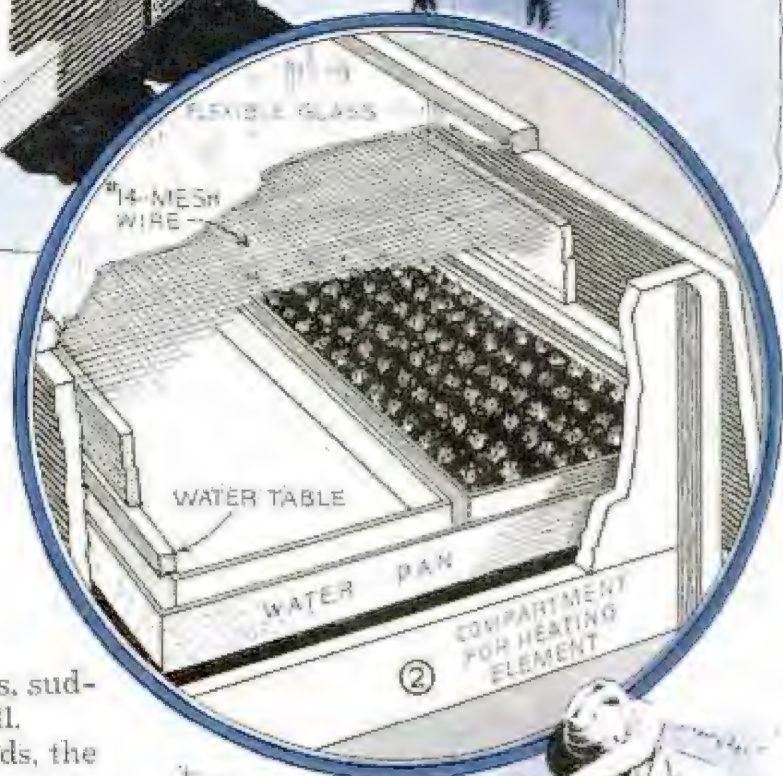
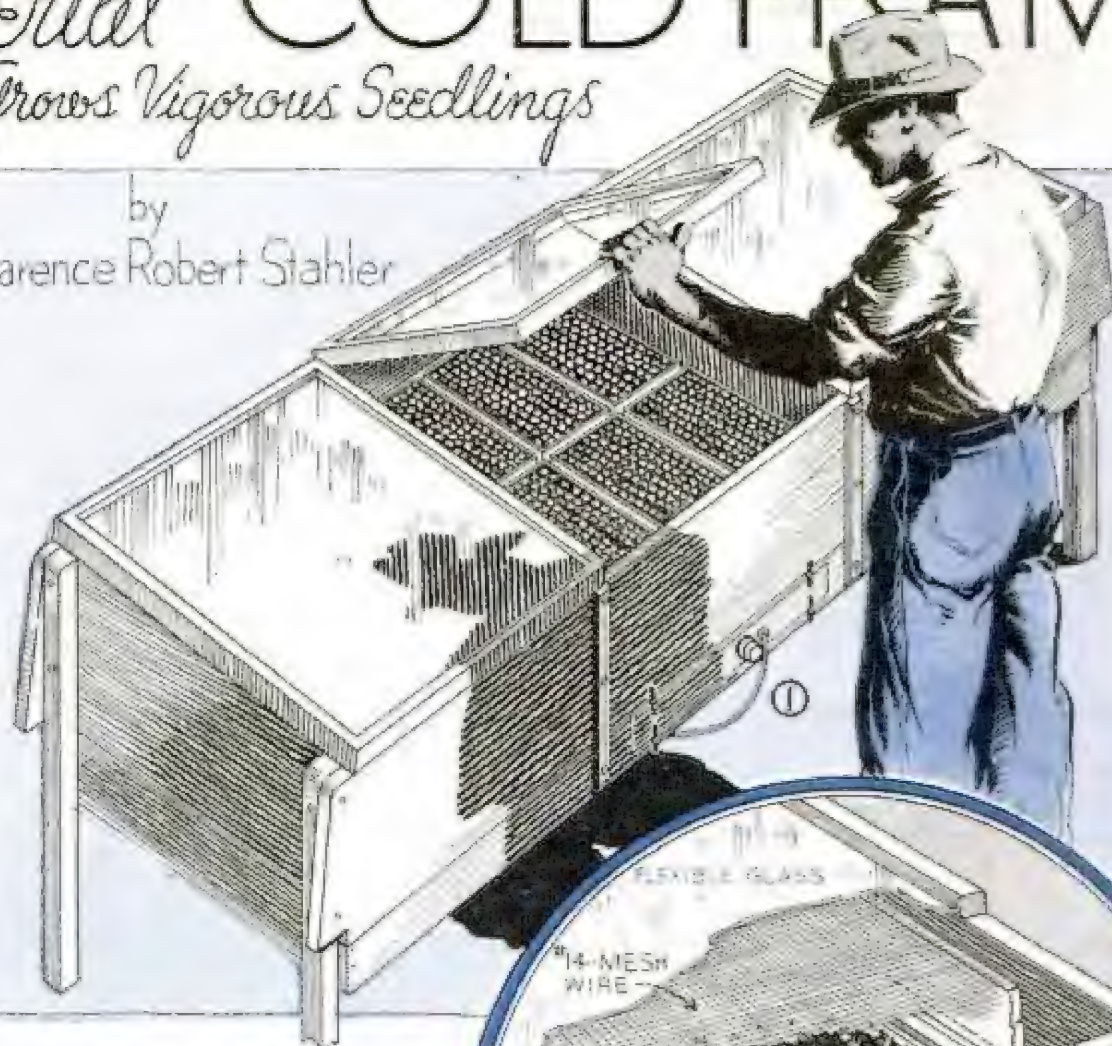
melted paraffin is not dangerously explosive, it is easily ignited. Therefore, care should be taken to see that it does not come in contact with a flame.

¶If strong alkaline soaps are used in washing decorated china, they will cause gold bands and other decorations to deteriorate and ultimately disappear.

"Aerial" COLD FRAME

Grows Vigorous Seedlings

by
Clarence Robert Stahler

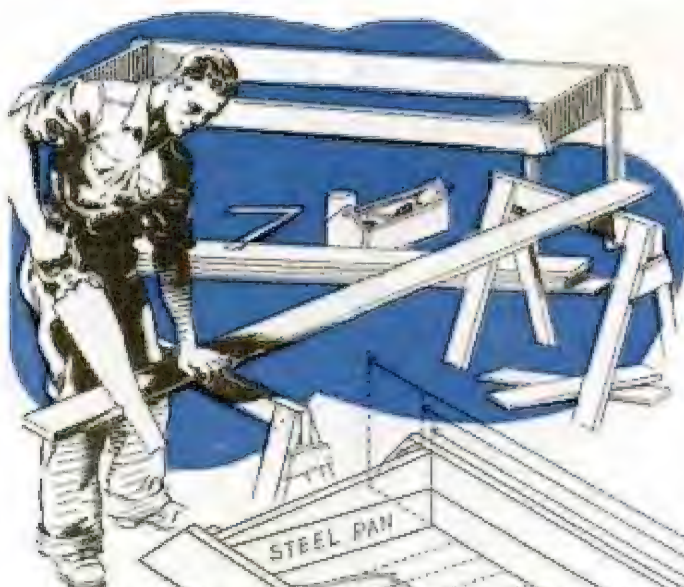


MANY are the hazards besetting cold-frame and hotbed culture of seedlings. Manure-heated beds often cool prematurely and subject the plantlets to ammonia-fume injury. Care and watering methods are tedious in both the cold frame and hotbed, and often there occurs complete destruction of the seedlings by "damping-off." Cutworms, cats, dogs, sudden beating rains—all take their toll.

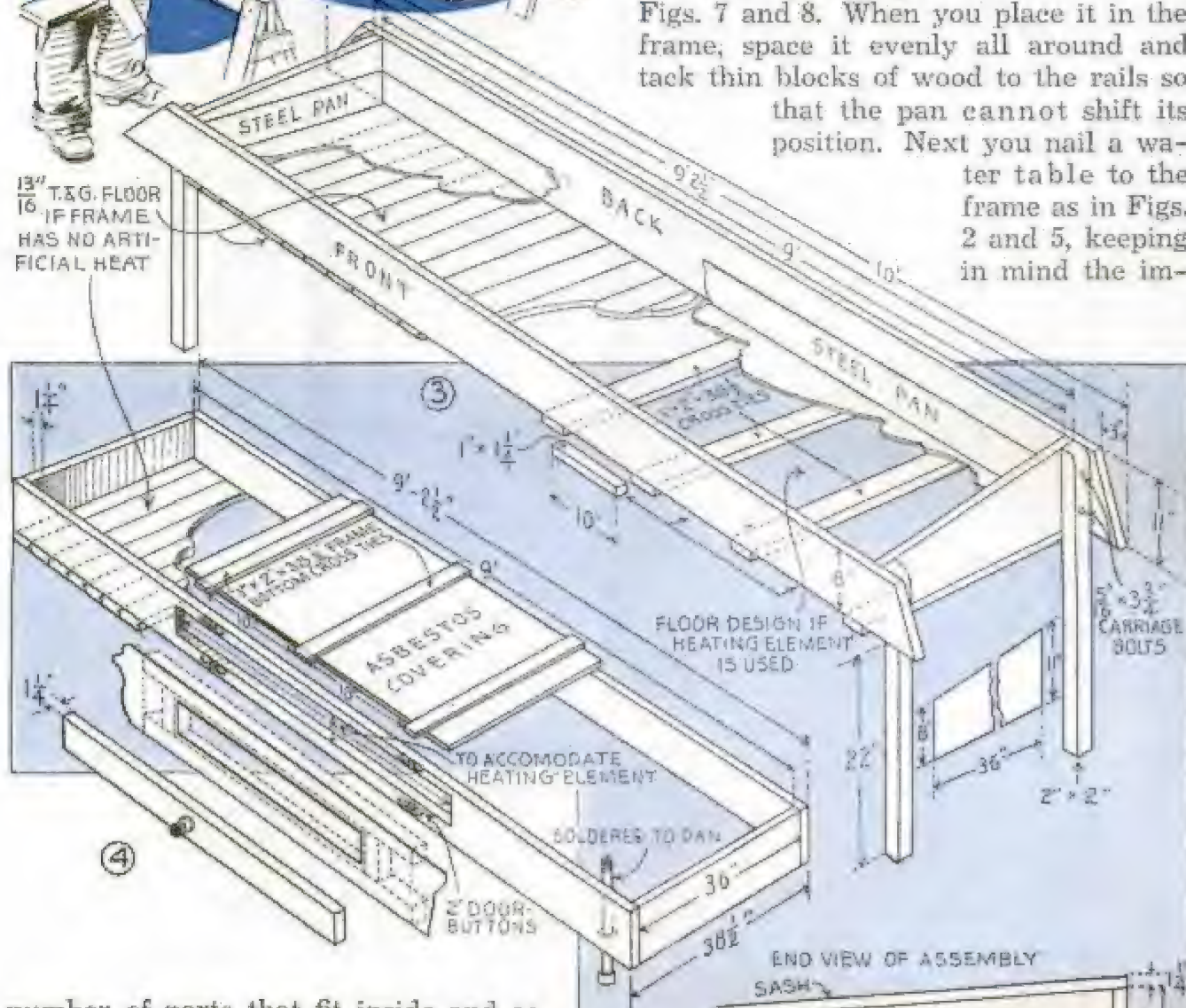
Designed to eliminate these hazards, the "aerial" cold frame and hotbed shown in Fig. 1 will accommodate approximately 720 seedlings spaced 2 in. apart in eighteen flats. The frame length may be shortened, if desired. Use a good grade of decay-resistant lumber such as cypress, sound and free from knots, priming all parts of the frame before assembling. The construction is shown in Fig. 2, from which you will note several advantages over the regular type of cold frame. There are a



The cutaway view above lets you in on the secret of uniform success with this cold frame. Seedlings are watered by natural capillary action and a screen gives the desired "dappled" shade



13" T.&G. FLOOR
16" IF FRAME
HAS NO ARTIFICIAL HEAT



number of parts that fit inside and as the wood may warp slightly, they should be made and fitted with care. The frame may be made for use without artificial heat, and the heating compartment added later, with slight alterations. When the frame is made for use without a heating element you have to depend on sash adjustment, uniform watering, and a southern exposure for proper growing conditions.

Now to begin construction. Figs. 3, 4 and 5 give the details. Notice particularly the variations in the floor in Fig. 3.

After getting out the front, back and end rails from 1 1/4-in. stock to the finish size, the parts are bolted to the legs, then nailed together and squared ready for the floor. The front legs are 30 in. and the rear legs, 33 in. in length, over-all. After adding the floor, you bore a hole for a 1/2-in. pipe nipple in the right-hand corner about 3 in. from the front and end-rail joint. Now you can make up the water pan of galvanized iron as in Figs. 7 and 8. When you place it in the frame, space it evenly all around and tack thin blocks of wood to the rails so that the pan cannot shift its position. Next you nail a water table to the frame as in Figs. 2 and 5, keeping in mind the im-

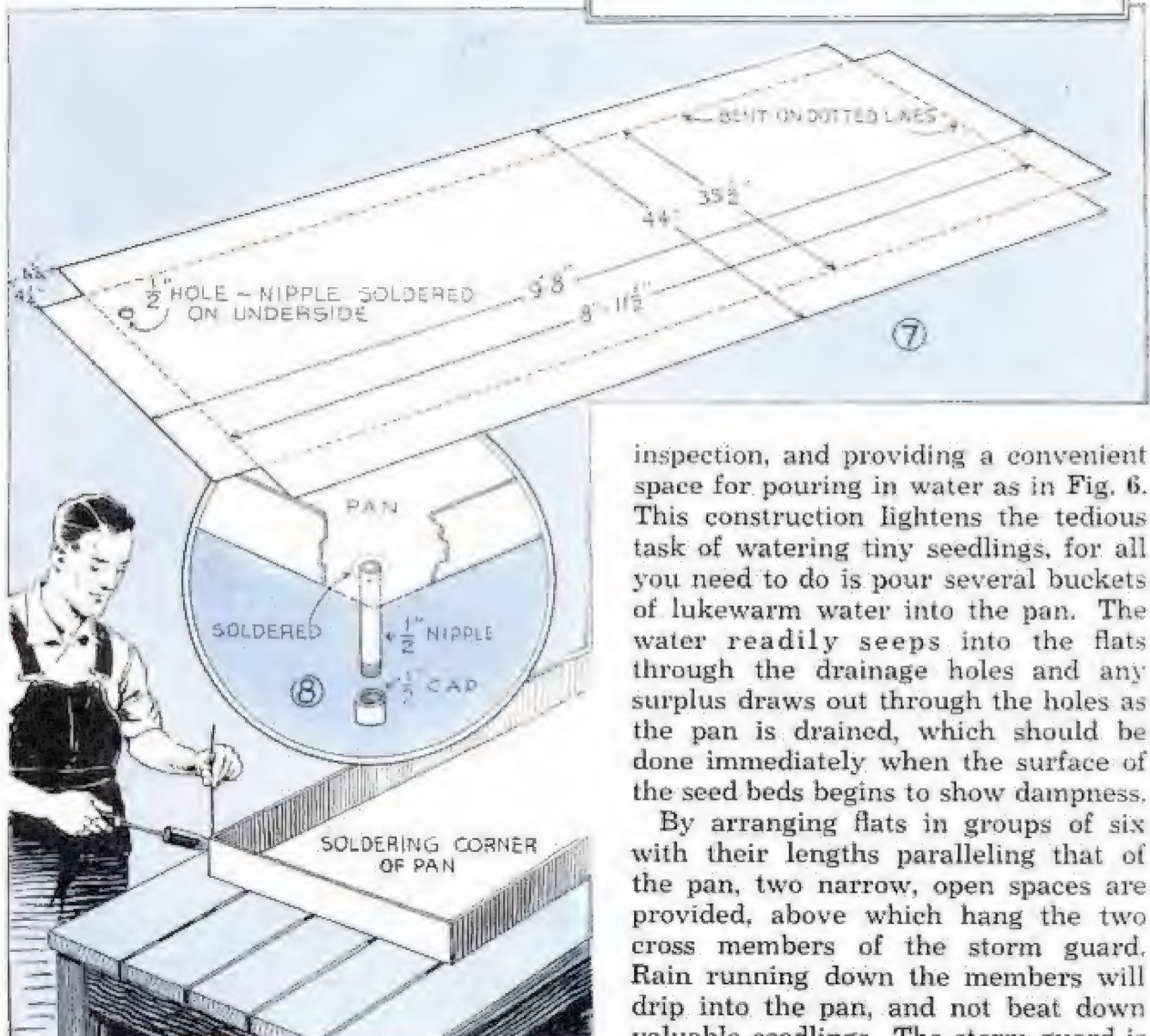
You can build the frame either with or without a heater compartment. Cypress is the lumber to use for the frame as it resists decay. The material should be primed before assembling it

portant $\frac{1}{4}$ -in. air space between the top edge of the pan and the water table. Though a somewhat permanent fixture, the pan may be removed by prying off the water table, the main purpose of which is to direct rain falling, while frame is open, into pan.

The flats, which are built to fit inside the water pan, have drainage holes about 3 in. apart. As the flats must be elevated slightly above the bottom of the pan, $\frac{1}{4}$ by 1 by 1-in. blocks of wood are tacked to the bottom corners and one in the center. The purpose of this is threefold: It permits rapid entrance of water through drainage holes, positive drainage and air circulation between bottom of flats and pan. One flat is made 4 in. shorter than the others. It is placed in the lower right-hand corner of the pan, thus leaving the drainage hole open to

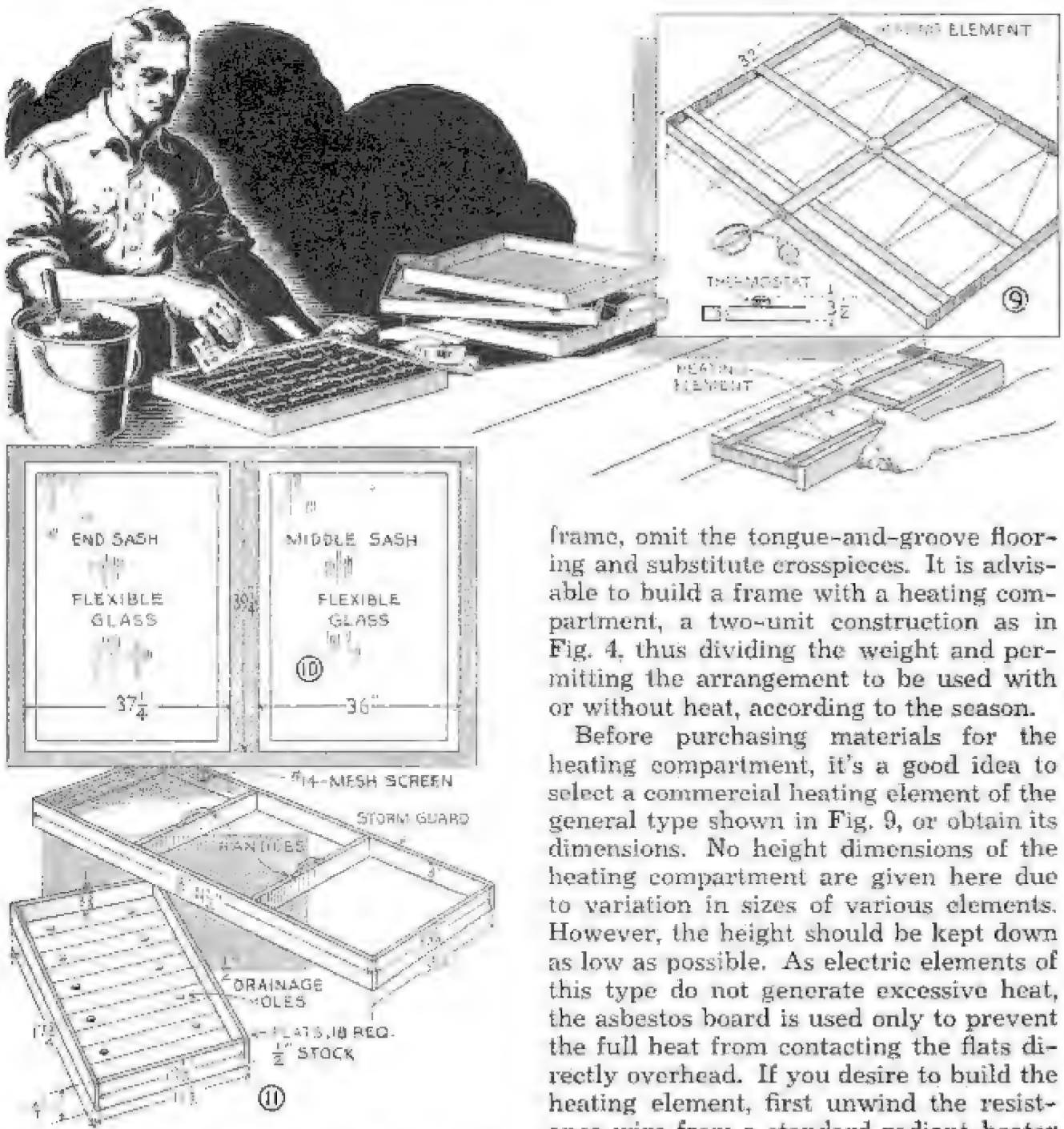


Water reaches the seedlings from the water pan in which the flats are placed. When moisture shows on the surface of the flats, excess water is drained from the pan



inspection, and providing a convenient space for pouring in water as in Fig. 6. This construction lightens the tedious task of watering tiny seedlings, for all you need to do is pour several buckets of lukewarm water into the pan. The water readily seeps into the flats through the drainage holes and any surplus draws out through the holes as the pan is drained, which should be done immediately when the surface of the seed beds begins to show dampness.

By arranging flats in groups of six with their lengths paralleling that of the pan, two narrow, open spaces are provided, above which hang the two cross members of the storm guard. Rain running down the members will drip into the pan, and not beat down valuable seedlings. The storm guard is



an important part of the whole arrangement. It should always be in place, with its fine wire mesh ready to break up large raindrops and deliver them to the seedlings as mist. The guard furnishes the desirable "dappled" shade, which may be increased by using No. 14 mesh wire and building up the wire diameter with a coat of heavy paint. The guard also breaks drying winds.

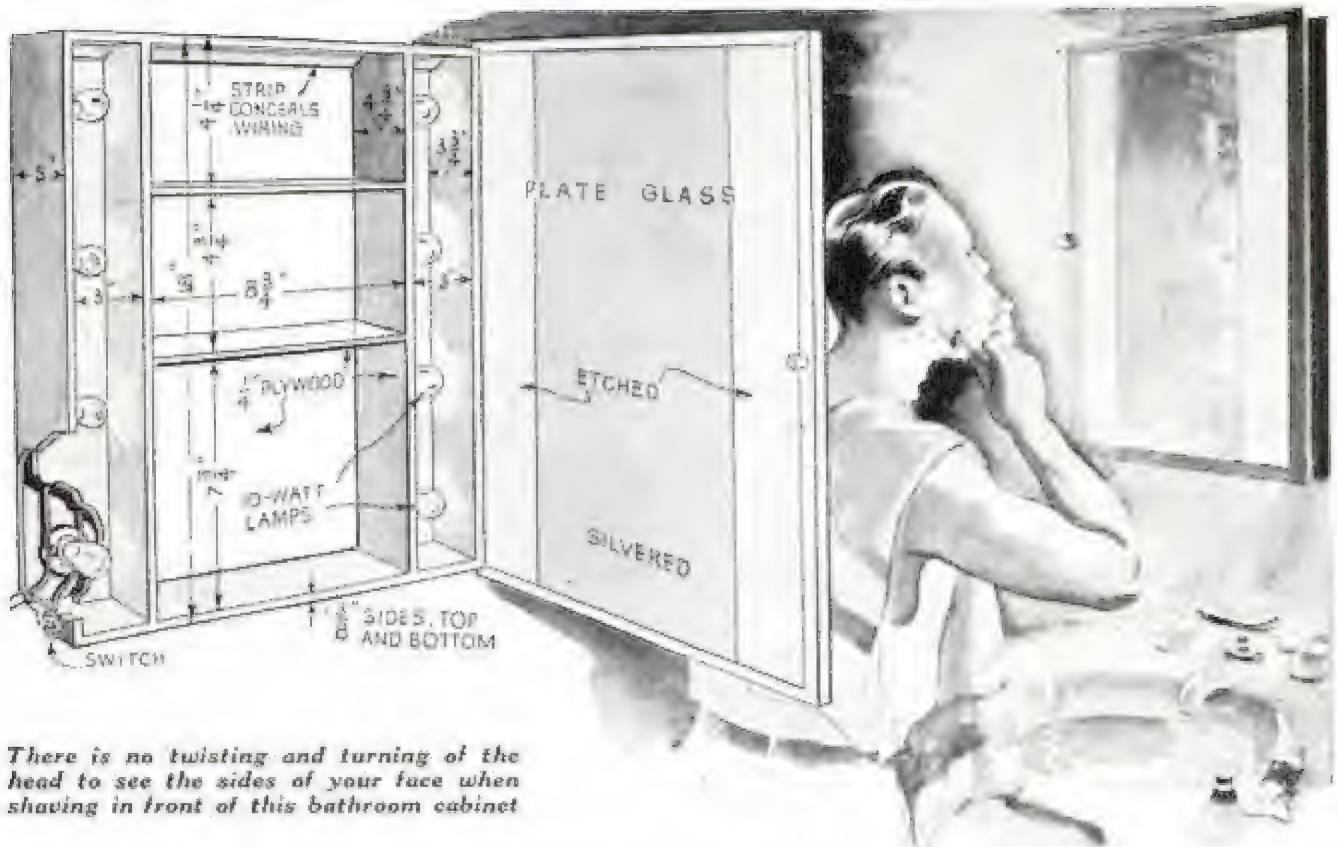
Any substantial method of sash-corner joining may be used, providing it permits the sash to rest snugly on the frame rails. Flexible glass, which is more nearly unbreakable, is preferable to ordinary glass. If you add a heating compartment to the

frame, omit the tongue-and-groove flooring and substitute crosspieces. It is advisable to build a frame with a heating compartment, a two-unit construction as in Fig. 4, thus dividing the weight and permitting the arrangement to be used with or without heat, according to the season.

Before purchasing materials for the heating compartment, it's a good idea to select a commercial heating element of the general type shown in Fig. 9, or obtain its dimensions. No height dimensions of the heating compartment are given here due to variation in sizes of various elements. However, the height should be kept down as low as possible. As electric elements of this type do not generate excessive heat, the asbestos board is used only to prevent the full heat from contacting the flats directly overhead. If you desire to build the heating element, first unwind the resistance wire from a standard radiant-heater element, pull the wire straight and then arrange it on a wood frame. Porcelain knobs should be used to hold the element. The ends of the resistance wire are twisted to the bared ends of a length of a flexible waterproof cable, which supplies current. A suitable thermostat, mounted in the center of the heater frame, is cut in one of the supply lines.

Select an accurate thermometer whose frame at top and bottom is bent back at right angles. The bottom projection is bent up so that it can be fastened in sloping position at one end of a flat. The thermometer is located in the center of the frame so that the sun strikes the bulb.

Bathroom Cabinet Has Self-Contained Light



There is no twisting and turning of the head to see the sides of your face when shaving in front of this bathroom cabinet

Combining neatness and compactness with modern diffused lighting, this bathroom cabinet not only illuminates both sides of the face for shaving, but it floods the bathroom with non-glaring light. Recessed into the wall in the conventional manner, the cabinet differs from the usual flush, mirror-faced type in that narrow wells at the ends of the shelves house electric bulbs. The portions of the mirror covering the bulbs are unsilvered and are etched or frosted to diffuse the light. By

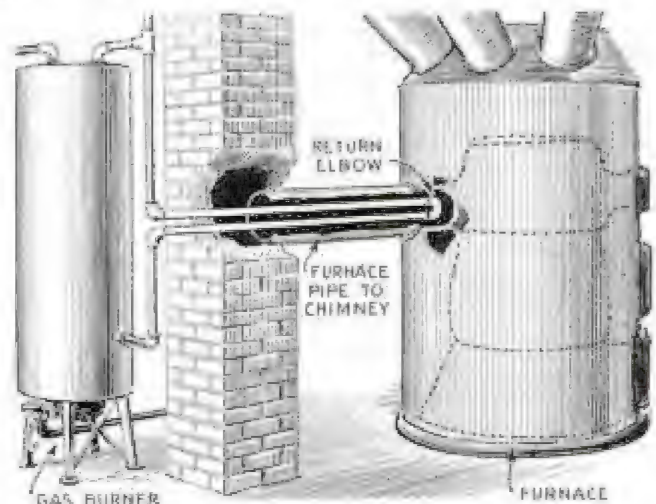
having the silvered area and the etched areas on the same piece of plate glass, a maximum of strength with a minimum of over-all size is obtained. The lamps are accessible for cleaning and replacement without the necessity for separate framing of the etched panels. The cabinet is constructed of plywood. Glass may be etched by rubbing with fine emery powder, gummed paper first being pasted along the edges of the center area to protect the silvering.

Home Water Tank Heated by Waste Gases in Smoke Pipe

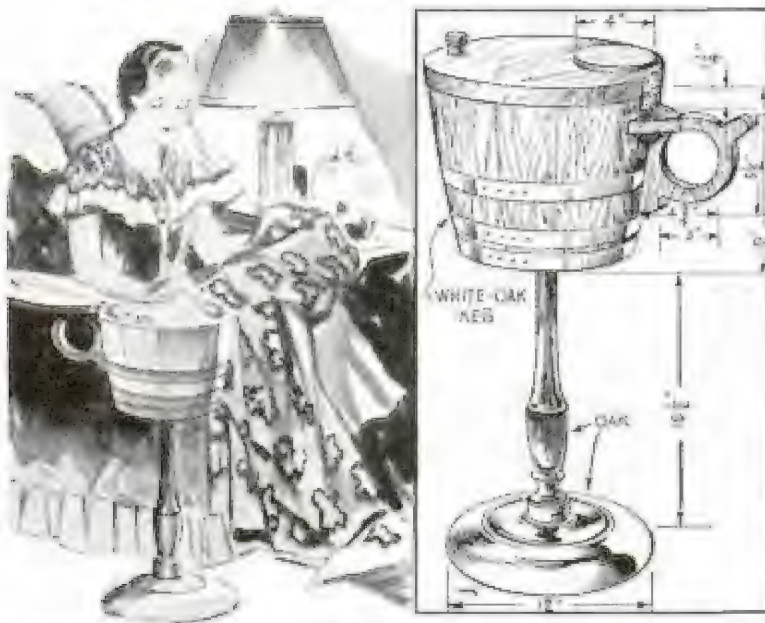
As the distance between my furnace and hot-water tank could not be reduced easily, I found it practical to install a water-heating unit in the smoke pipe as shown. In my case, this installation has proved more satisfactory than the usual type of water back in the furnace as it eliminated long feed pipes with a resulting reduction in wasted heat radiation.

—R. K. Beal, Marion, Ohio.

❑ If your doorbell is fastened to the underside of one of your hot-air furnace registers, it can be heard in the basement.



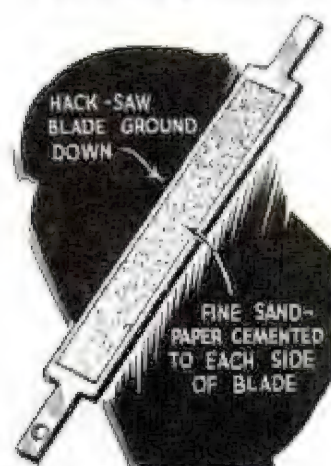
Sewing Basket from Small Keg Resembles a Large Wood Cup



Very little work is required to convert a keg, which can be purchased cheaply, into this novel sewing basket

Here is a sewing basket which is simplicity itself, yet it is unusually attractive in any surroundings. Made from one half of a small white-oak keg about 19 in. high, the basket is supported by a standard and base turned from oak to match the keg. The lid and handle are solid oak, the sole purpose of the latter being to support the lid when open and to carry out the cup resemblance. The interior of the basket can be finished as desired. In this case, a half-moon tray, which lifted out, was attached to the side of the basket to hold thread, buttons, etc., and the underside of the lid was fitted with felt holders for scissors and other accessories.

Sanding Blades for the Jig Saw



For sanding intricate scrolls and similar work where the job would be tedious if done by hand, you can do it quite easily by using these improvised sanding blades in your jig saw. They are made by grinding pieces of

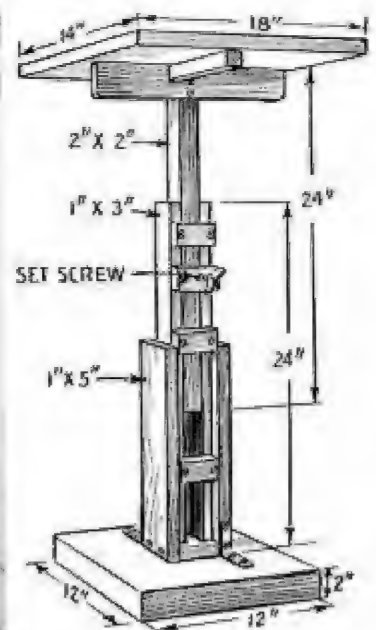
hack-saw blades to the shape shown, and then cementing abrasive paper to both sides of them. I find that bicycle-rim cement is best for this purpose as it sets quickly and is inexpensive.

—H. R. Hearn, Greenville, S. C.

Vertical Enlarging Easel Is Adjustable in Height

A useful addition to your dark-room, this vertical enlarging easel is readily constructed from scraps of wood. The dimensions, of course, will vary with the focal length of your particular enlarging lens, the degree of enlargement desired and the height of the lens from the floor. The standard of the easel slips inside of a U-shaped sleeve to which is screwed 1 by 5-in. supporting

members securely attached to the base as shown, flat-iron braces being used. When the standard has been adjusted for height,



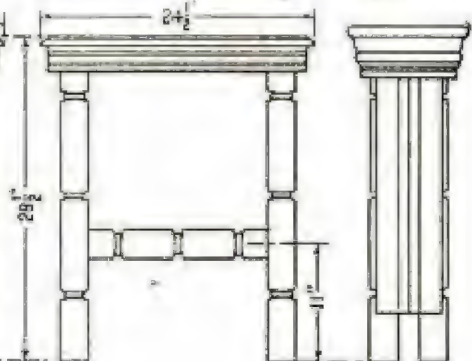
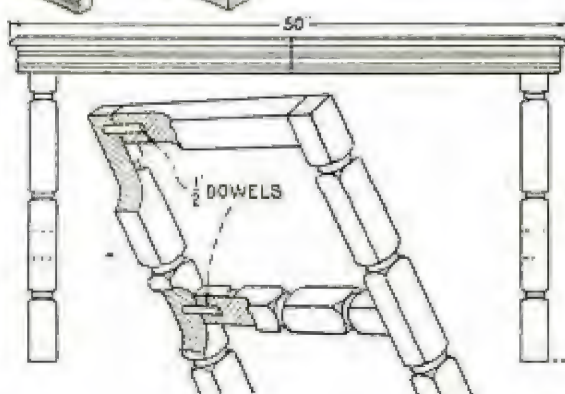
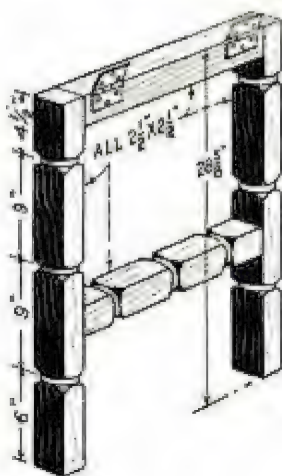
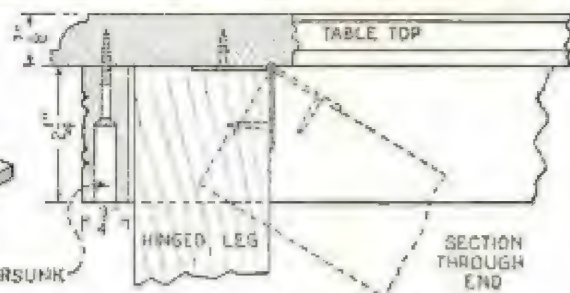
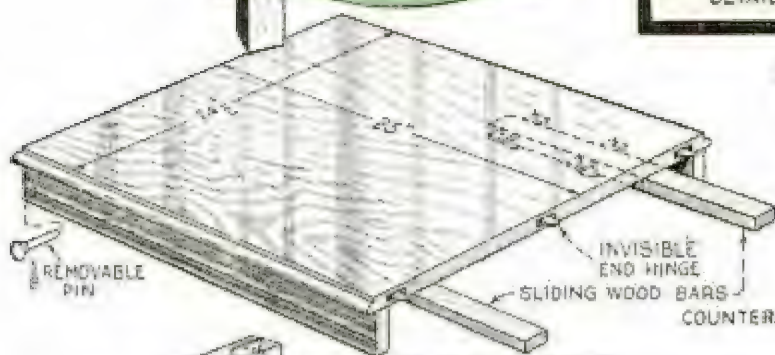
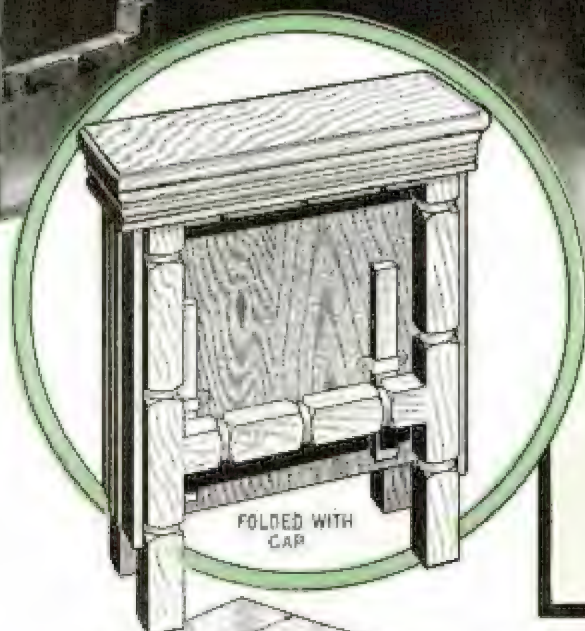
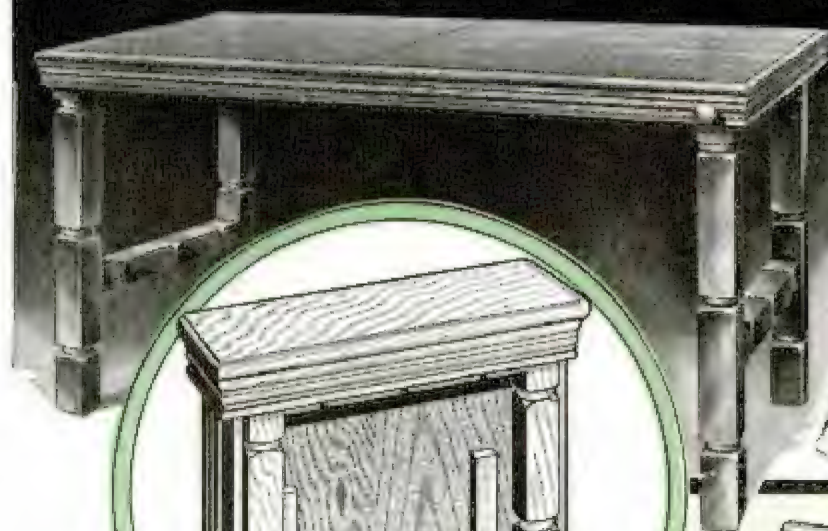
Be sure that the easel is perfectly level, otherwise the image will be distorted

a thumbscrew holds it in place. The thumbscrew is fitted to a cleat across the open side of the sleeve, while similar cleats serve to strengthen the assembly.

Green bananas will ripen quickly if they are placed in a paper bag and stored in a dark place.

LARGE TABLE

folds into small unit



Slide back two bars beneath the top, pull a couple pins and this 50-in. table collapses into a small unit but a fraction of its original size. When folded, a neatly molded cap fitting over the legs makes it look just like an ordinary occasional table

Glazier's Gloves Have Fingers That Won't Slip

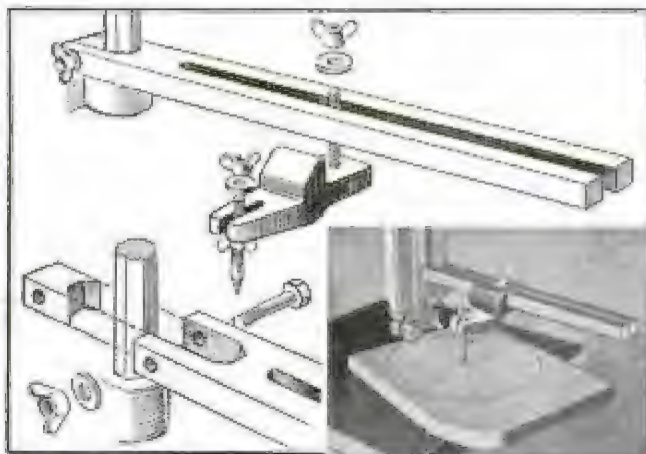


Glass panes are less likely to slip out of your hands when these patches are applied to tips of gloves

Canvas gloves, which are often worn by glaziers, may be made more convenient for lifting and carrying large panes of glass if the fingers are rubber tipped. Simply use inner-tube patches, applying them to the gloves in the regular way, using two liberal coatings of rubber cement on the canvas. The cement should be allowed to dry between coatings and before applying the patch.

Jig for Band-Sawing True Circles

Cutting true disks on a band saw is accurately done with the aid of this simple guide. It consists of an arrangement as shown, which has a pointed pivot to swing the work. The pivot must be directly on a line at right angles with the line of cut and neither ahead nor back of the cutting



This adjustable guide will handle disks up to a radius equal to one half the table width

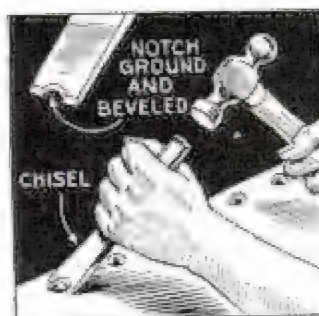
edge of the saw blade. The block that holds the pivot is adjustable for different diameters.—Brooks Hill, Neosho, Mo.

Rubber Feet on Alarm Clock Protect Table Top

Fitted over the legs of your alarm clock, small penny pencil erasers of the type shown will prevent scratching the top of a table. If the openings in the erasers are too large, you can shim them with paper.



Rivets Rapidly Sheared Off When Chisel Is Notched



When a cold chisel used for cutting rivets has a half-circular notch in the cutting edge, the job goes much faster than with an ordinary edge as any tendency to slip

off the rivet is prevented. The notch, of course, is ground to a bevel to match the rest of the cutting edge of the chisel.

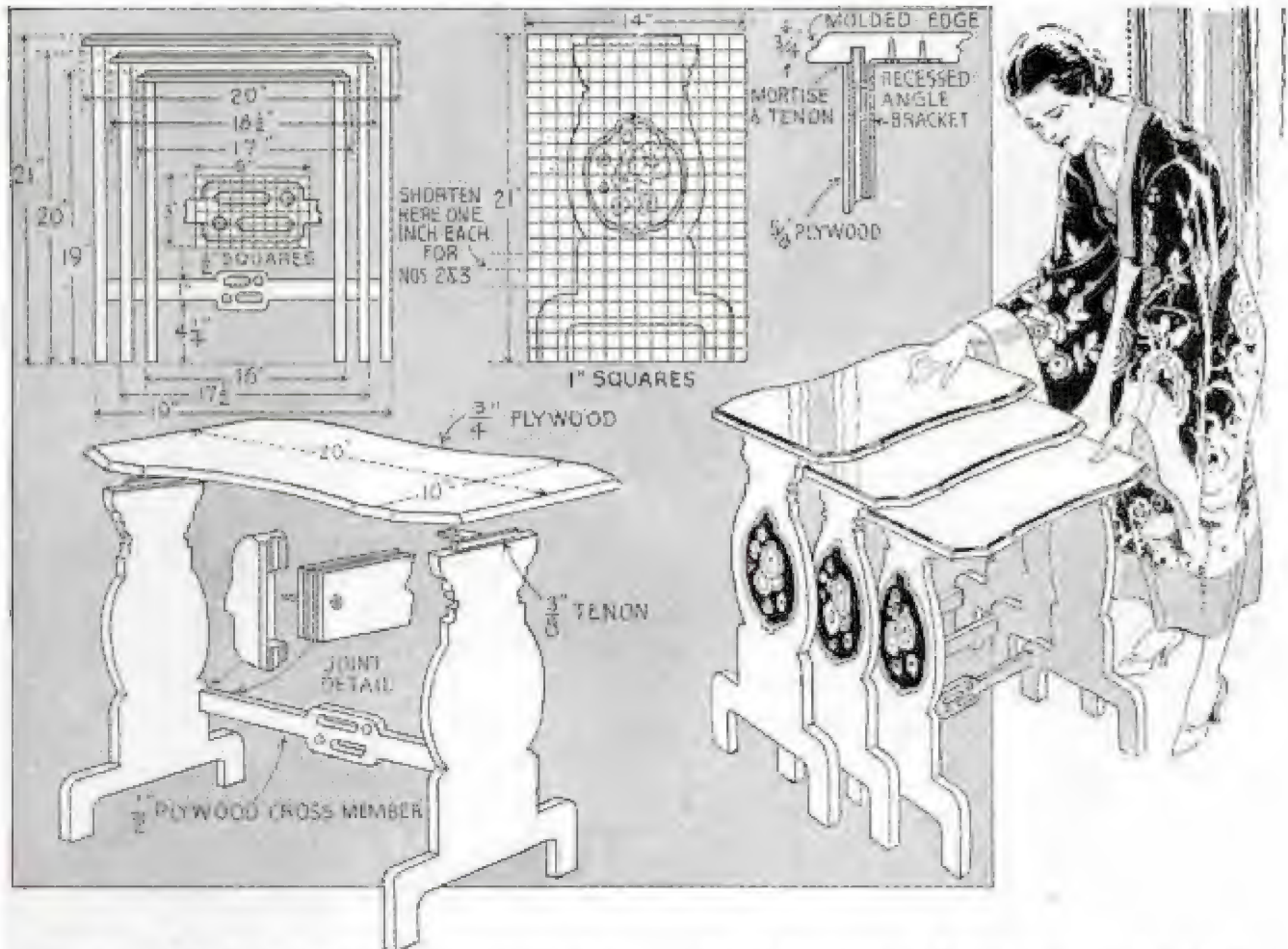
Loosening Tight Screw Caps

If you are unable to grip a screw cap on a can or bottle tight enough to loosen it, try looping a rubber band around it. This will help provide a non-slip surface, which can be gripped easily, especially if the hands are a little wet or greasy.



⚠ Cutlery which has bone, ivory or pearl handles should not be permitted to remain in water for more than an instant, if at all.

Nested Tables in a Modified Chinese Design

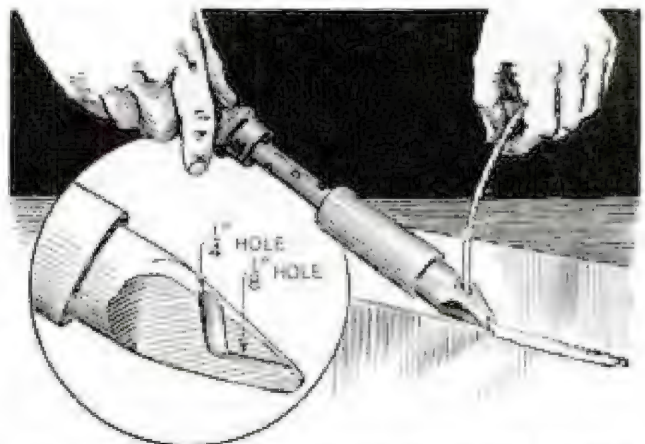


As a modified American adaptation of a Chinese design, these nested tables are unusually attractive if finished in white and "Chinese" red. Plywood is used throughout and each table is 1 in. lower and 1½ in. shorter in length than the one above it, although the widths may be equal. Tops and legs have mortise-and-tenon joints and are reinforced with angle brackets concealed under the tops and set flush with the wood surface, while the cross members are merely mortised and screwed into the leg pieces. All screw holes and finished joints are filled with plastic wood which, when dry, is sanded down. The tables are finished with brushing lacquer over a suitable ground coat, the decorations on the leg pieces being hand-painted or stenciled to suit. The edges of the tops are finished in a contrasting color.

❏ When washing glass vessels in hot water, dip the open end into the water first. If the bottom touches the water first, the sudden expansion is apt to break the glass.

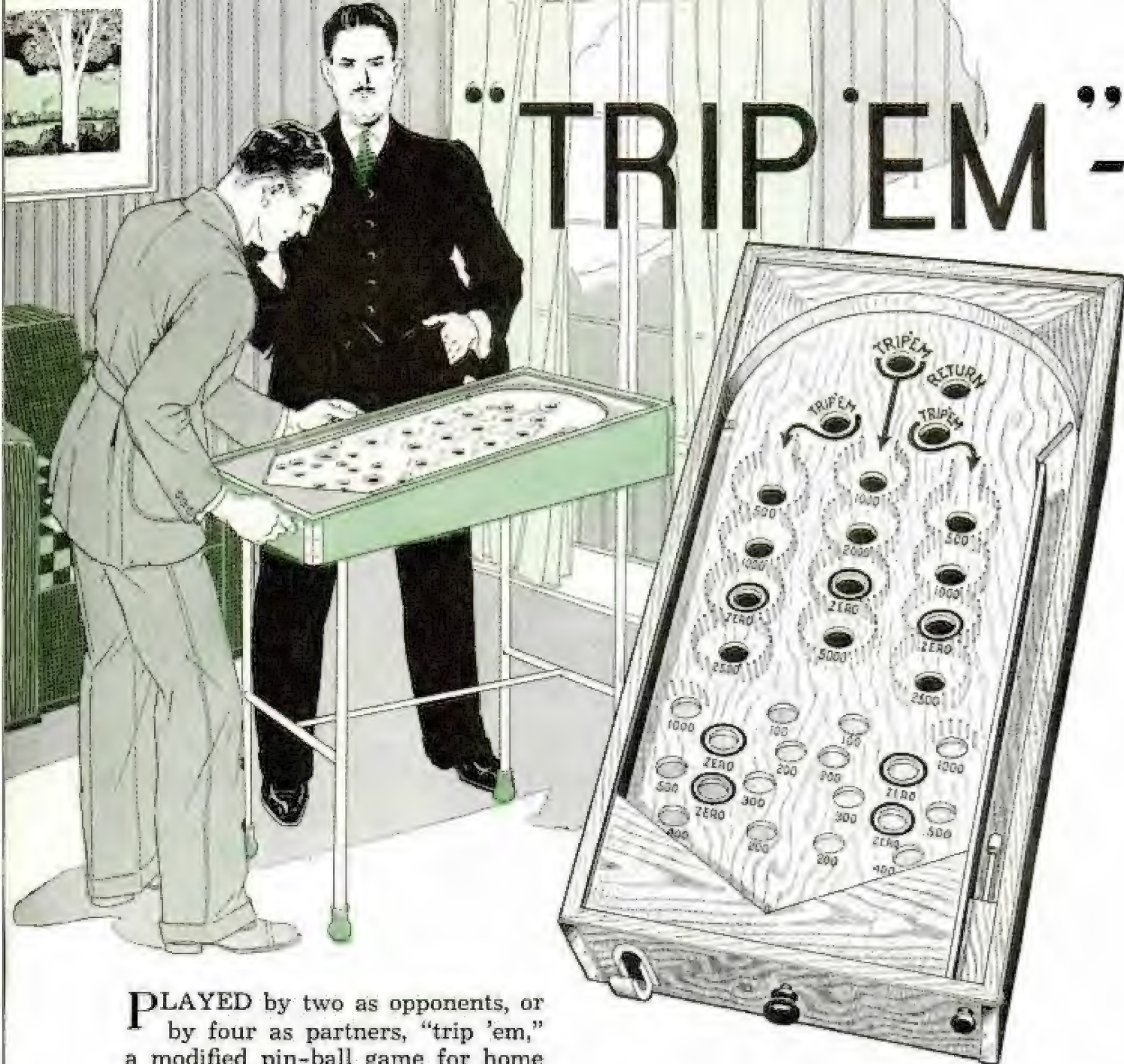
Self-Feeding Iron Saves Solder and Speeds Large Jobs

One tinsmith who has many jobs which require soldering long seams, uses a self-feeding iron like the one shown. He claims that the iron enables him to do neat jobs and save solder as it flows evenly over the seams. Wire solder is fed into the hole in the copper end where it is melted and flows out of the hole at the tip.



Long seams in sheet metal are neatly and quickly soldered with this altered iron

TRIP 'EM



PLAYED by two as opponents, or by four as partners, "trip 'em," a modified pin-ball game for home entertainment, will prove a highly competitive pastime, as it is possible for a player to reduce his opponent's score by getting one of his balls in the right trip-'em hole, which will cause all the balls in the holes below it to be returned for re-playing. A magnetic trip or kicker adds further interest by automatically kicking balls that reach the front of the board back over the scoring surface until they drop into a hole. In the early stages of the game, the objective of each player is to put his balls in the center "corral" until "zero" is reached. If a player sees that he has two or more consecutive balls to shoot, he may play for the zero in hopes of getting the 5,000 hole on the next shot. When a player has several balls in any of the three corrals, his opponent will play for the respective trip-'em hole to dump the

balls out. The trip 'em feature contributes an uncertainty to the game which sustains interest until the final ball has found a pocket.

Consisting of a number of scoring holes, seven zero or non-scoring holes, three trip 'em holes and one return, the game is played with thirteen $\frac{7}{8}$ -in. balls, two sets of six being of different colors with the odd ball a third color. The odd ball with its score goes to the player whose ball precedes it in the ball cup at the lower left, the same being true if the odd ball has already been tripped out of one of the corrals.

The game-board cabinet, Figs. 4, 7 and 10, is $\frac{3}{8}$ -in. plywood. The ball-return tray is $\frac{1}{2}$ -in. plywood and, as it fits snugly within the sides of the cabinet, it is braced

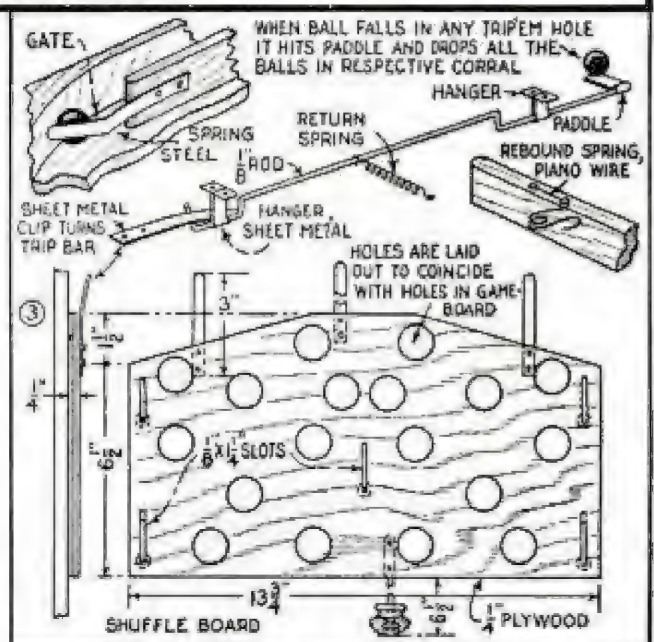
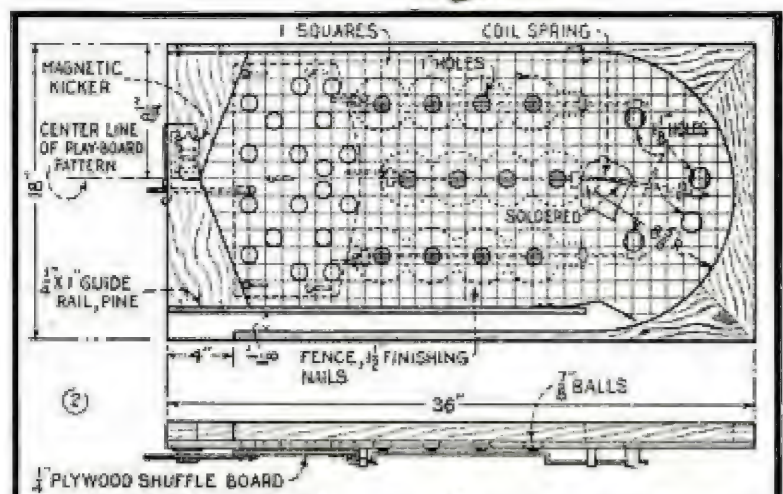
A home pin-ball game for two players

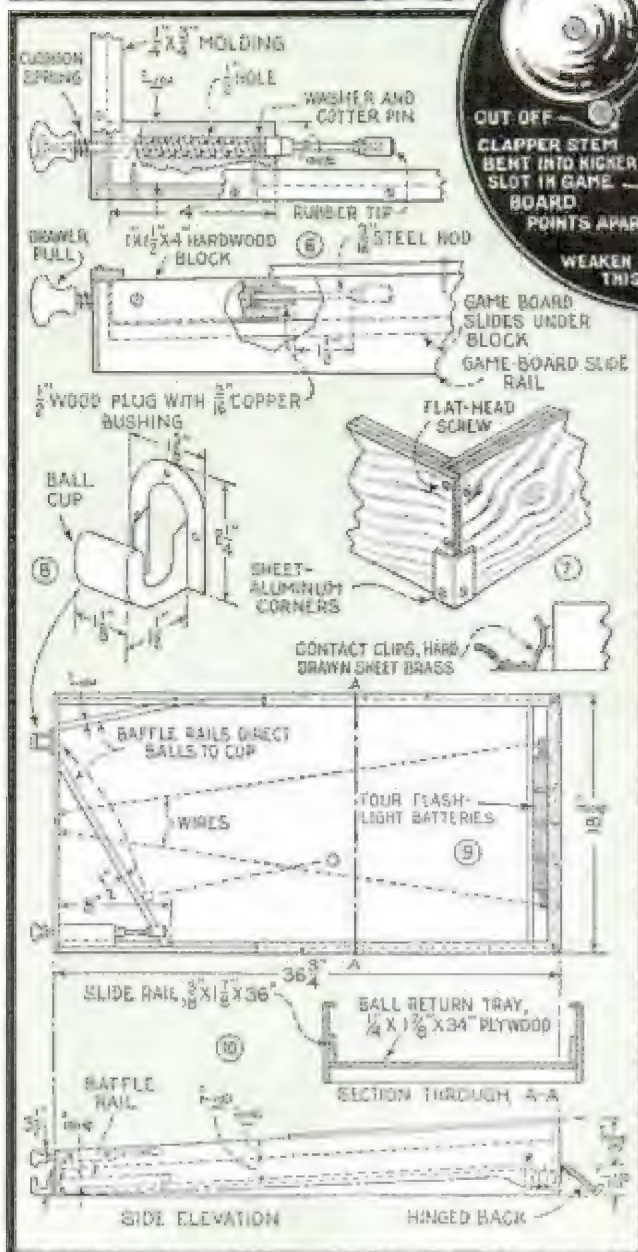
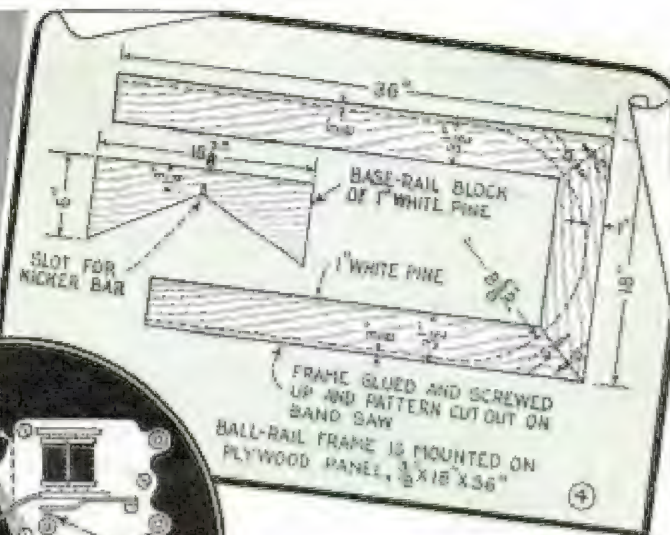


against distortion. The back is hinged to permit removal of the game board, for access to the flashlight cells, which operate the kicker. Wiring of the cells is given in Fig. 9. The wires lead from the cells underneath the ball-return tray to metal contact strips on the inside of the front piece of the cabinet. These, in turn, contact screw heads on the game board when it is in place. The spring-plunger block, Fig. 6, is a permanent fixture of the cabinet. The tension on the spring itself is reasonably soft so that a player can control the speed of the ball. When pulled back fully, the ball should rebound from the rebound spring back to the "gate," Fig. 3, and then back to about the center of the board. The ball-return cup, Fig. 8, is No. 24-ga. galvanized iron, and permits the player to see two balls, which, with one in the shooting trough, shows him the order of play for three shots. Baffle strips on the ball-return tray lead the balls to the cup.

Details of the game board are shown in Figs. 1, 2 and 3. It is $\frac{3}{8}$ -in. plywood on which is mounted the 1-in. ball rail and base block. Next, the sliding board or "shuffle" board is fitted in place as in Fig. 3. The "trip 'em" and the "return" holes are $1\frac{1}{8}$ in. in diameter, all the others being 1 in. in diameter. The "corral" fences around the holes are $1\frac{1}{2}$ -in. finishing nails spaced about $\frac{1}{8}$ in. apart.

Next is the tripping mechanism, which is shown fitted on the underside of the





shuffle board in Fig. 1. The trip rack is a $1\frac{1}{8}$ -in. rod and the hangers are of sheet metal. It will be seen that when a ball drops in a trip-'em hole, it strikes a tongue, or paddle, which turns the trip rack and drops all the balls in the corresponding corral onto the ball-return tray. When the game is over, and the shuffle board is

pulled out, sheet-metal tongues on the latter tilt the trip racks, dropping all balls in the corrals.

An altered electric doorbell with the bell and supporting arm removed, forms the kicker as shown in Fig. 5. The clapper shaft is bent at right angles to fit through a slot in the game board and the kicker is mounted so that the weight of a ball pressing against the vibrator points closes them and causes the clapper to vibrate. Careful adjustment of the kicker gives it just the right action.

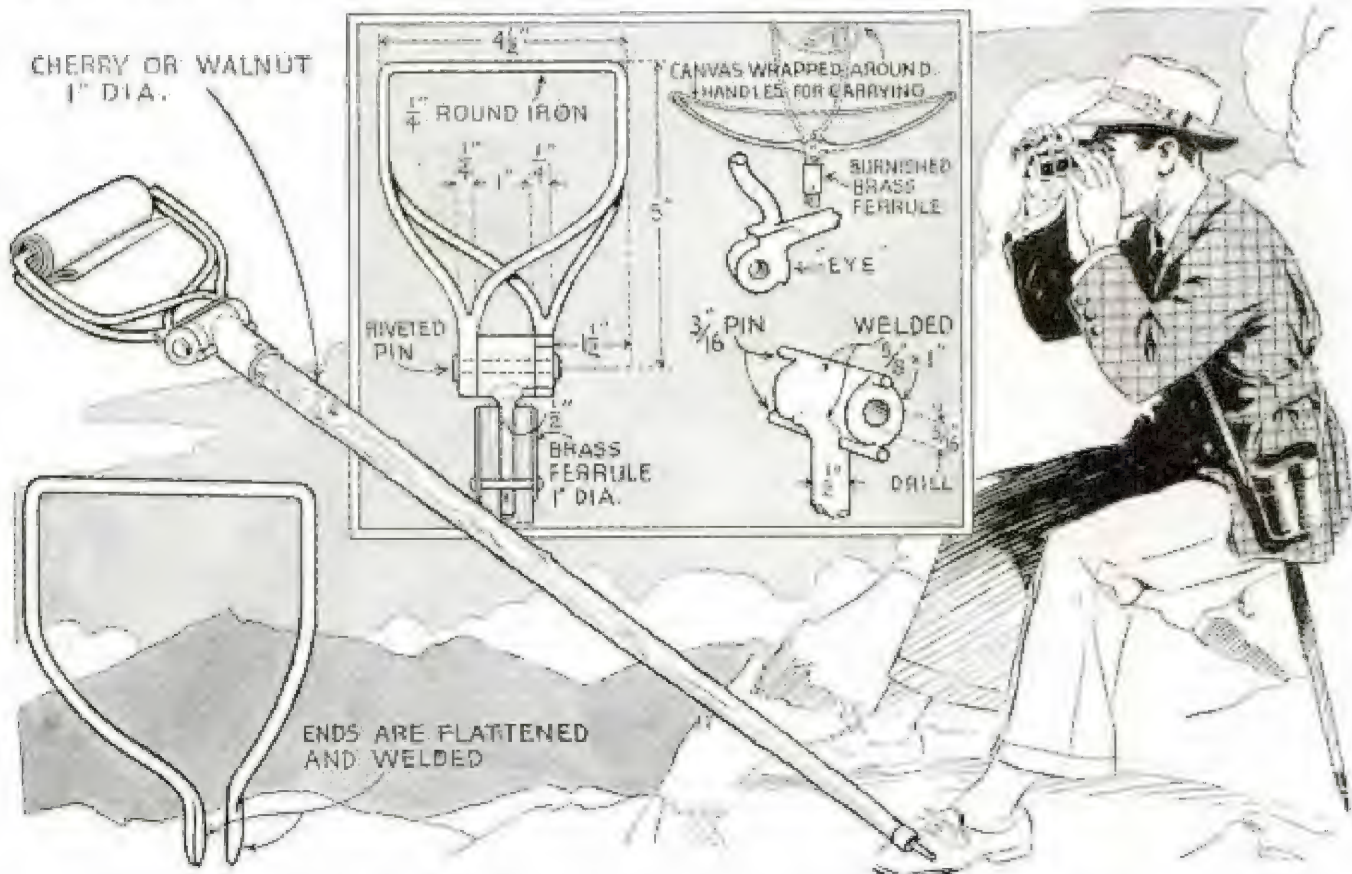
Screwdriver Altered for Use in Tight Places

One workman who had some screws to drive in a tight place where he couldn't reach with his fingers, altered an old screwdriver as shown, so that it would grip the screws to start them. The flattened part was sawed off, after which the shank was split back a couple of inches with a hacksaw and one side ground down to provide a blade. Then, the other side of the split portion was curved inward slightly.



☛ A little starch added to calcimine before brushing it on a wall will make it adhere firmly and help prevent streaking.

Novel Walking Stick Serves as Folding Seat



Patterned after a folding seat used by some British sportsmen, this novel walking stick unfolds into a seat, which is very useful at sporting events. It consists of a pair of hinged or pivoted brackets mounted on a substantial walking stick of cher-

ry, walnut or other hardwood. The brackets are shaped like stirrups. They are of $\frac{1}{4}$ -in. iron rod with the ends flattened and welded together, stop pins being welded to the bearing to prevent the brackets from rocking on the axis.

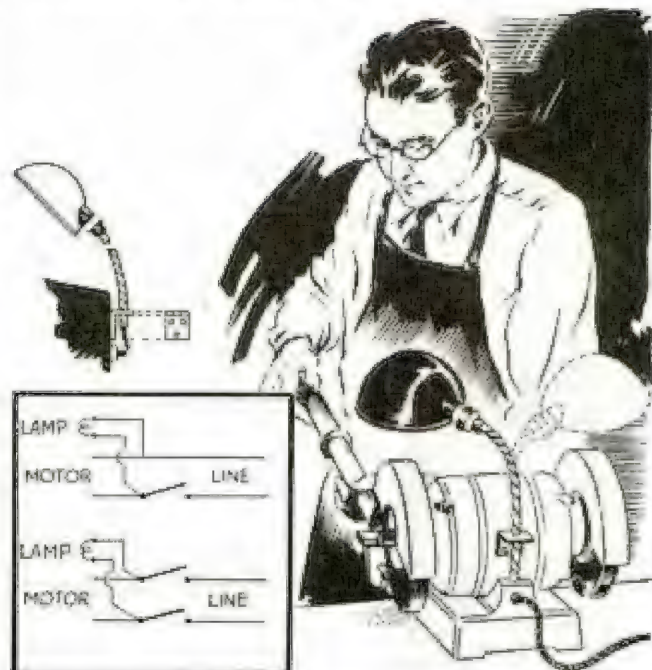
Light on Your Power Grinder Can Be Adjusted to Needs

Mounted on your home-shop power grinder with a flat-iron bracket, a desk lamp having a flexible shank permits quick adjustment to throw light where it is needed most. The lamp may be wired into the motor circuit so that it is turned on or off with the grinder. The wiring diagram shows the hookup for either a single-pole or a double-pole switch.

—Thomas Trail, Baltimore, Md.

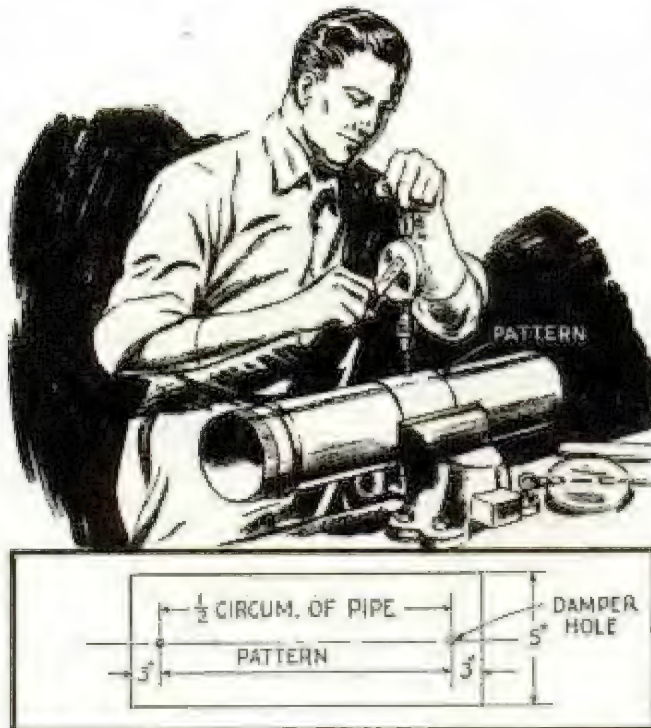
Giving Wood a Rough Finish

Rough finishes on wood can be made with a rotary wire brush, which tends to cut away the softer portions and leave the harder ones standing out in relief. The brush can be attached to any machine which will rotate it, such as a grinder or, it can be fitted to a flexible shaft.



Easily raised, lowered or turned from side to side, a desk lamp illuminates work at a grinder

Stovepipe Damper Set Accurately with a Pattern

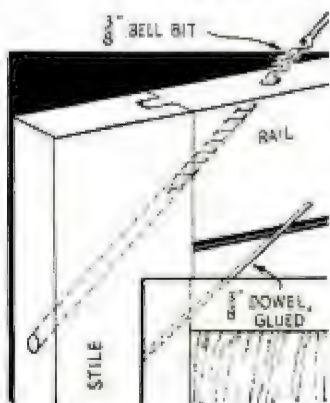


Paper pattern equal in length to one half of pipe circumference locates damper holes accurately

The problem of getting the holes for a damper in a stovepipe exactly opposite each other so that the damper will work freely, is solved by locating them with a pattern equal in length to one half the circumference of the pipe. To make the pattern, fold a strip of heavy paper around the pipe and cut it off just so that the ends come together. Then fold the strip in the center and cut it at the fold. When one of these strips is folded around the pipe and the damper holes drilled at its ends, in line with the centerline of the strip, they will be exactly opposite each other.

—L. H. Georger, Buffalo, N. Y.

Sagging Doors Are Strengthened by Concealed Braces



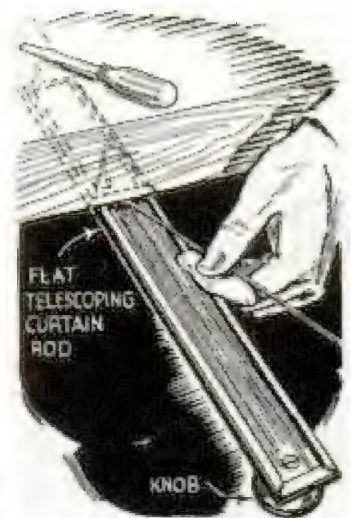
Doors that have a tendency to sag can be braced by doweling them at the corners as shown. When drilling the dowel holes, try to avoid damaging the door tenons as much as possible. Spiral

dowels are best for this work, as they can be fitted tightly into the holes without forcing out an excessive amount of glue when driving them in place.

—C. Serborg, De Motte, Ind.

Jig-Saw Blades Stored in Drawer Made from Curtain Rod

To keep jig-saw blades handy, a small drawer can be made from a flat, telescoping curtain rod. Cut two pieces of the rod and bend the narrow one in the manner indicated to form the sides and ends of the drawer. A wooden knob should be attached at the end. The wider

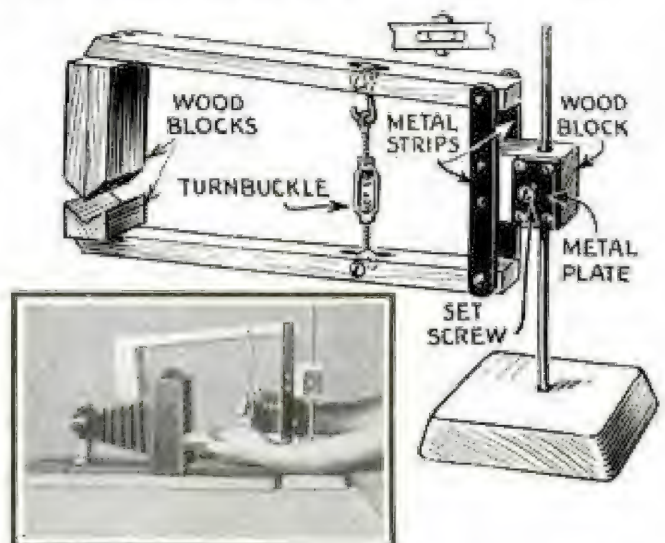


section of the rod is then nailed to the underside of the bench in a convenient place.

—G. E. Hendrickson, Argyle, Wis.

Clamp Aids in Repairing Camera Bellows That Leak Light

The job of patching a leaky camera bellows with strips of rubberized cloth to



This clamp fits into the folds of a camera bellows and holds patching strips until glue dries

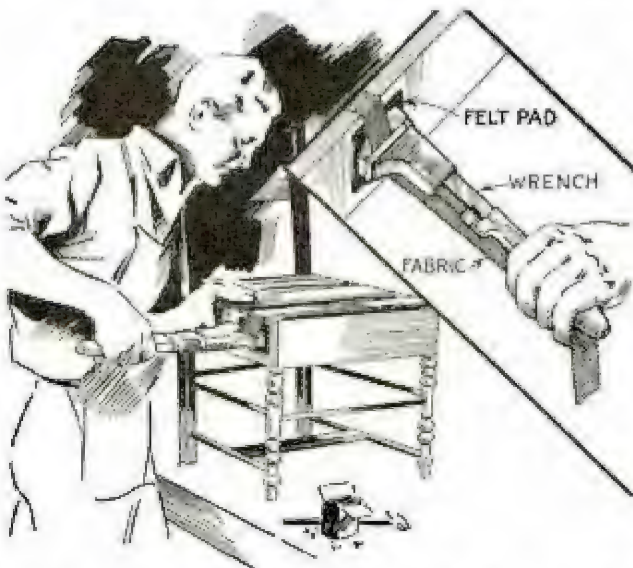
keep out light is simplified with this clamp, which has jaws that fit snugly into the folds of the bellows. The clamp consists of

two wooden arms which are pivoted at one end to a pair of parallel metal strips. The jaws are screwed to the other end of each arm. A small turnbuckle, engaging a hook pivoted to the upper arm, affords a means of setting the clamp in place and tightening the jaws on the work. The whole assembly can be raised or lowered on a vertical rod mounted on a wood base. A set screw holds the clamp at any height.

Upholstery Webbing Is Stretched with Monkey Wrench

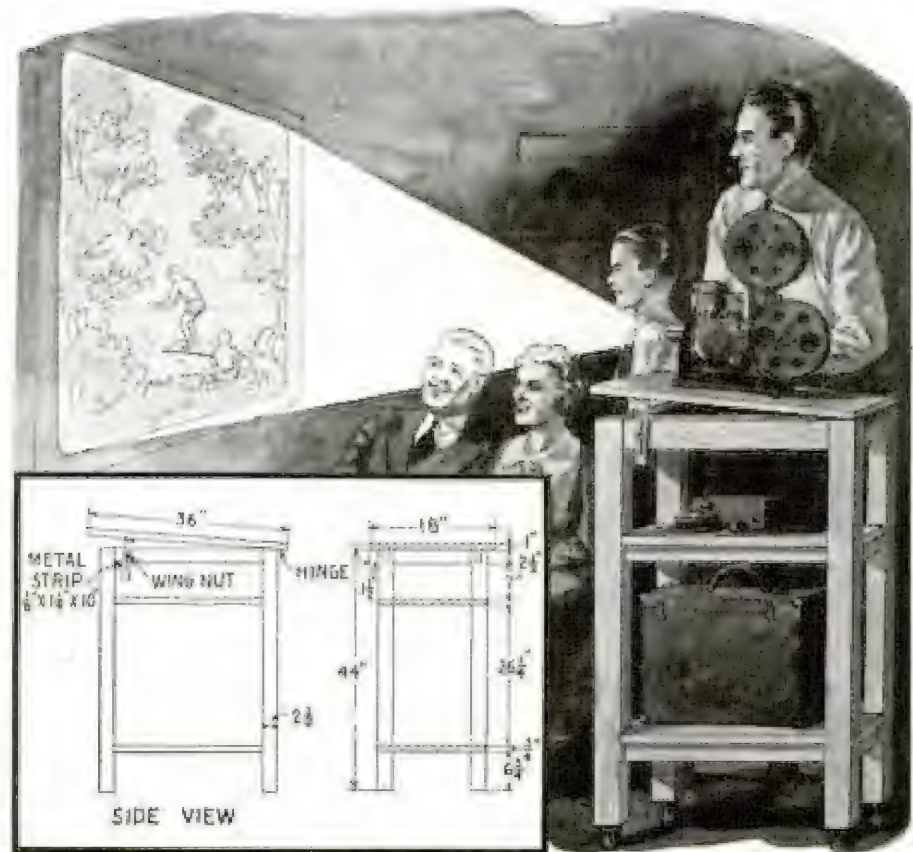
If you have a small job of upholstering to do and have no webbing stretcher at hand, a monkey wrench will serve the purpose. It is used in a manner similar to that of a regular stretcher. The jaws are tightened up on the webbing, which is then run back along the handle and is gripped with the fingers to prevent slipping. A pad of felt or similar material should be placed under the end of the wrench to avoid marring the furniture.

—A. H. Waychoff, Tempe, Ariz.



In the absence of a webbing stretcher for an upholstering job, try using a monkey wrench

Home-Movie Projection Stand Has Adjustable Tilting Top

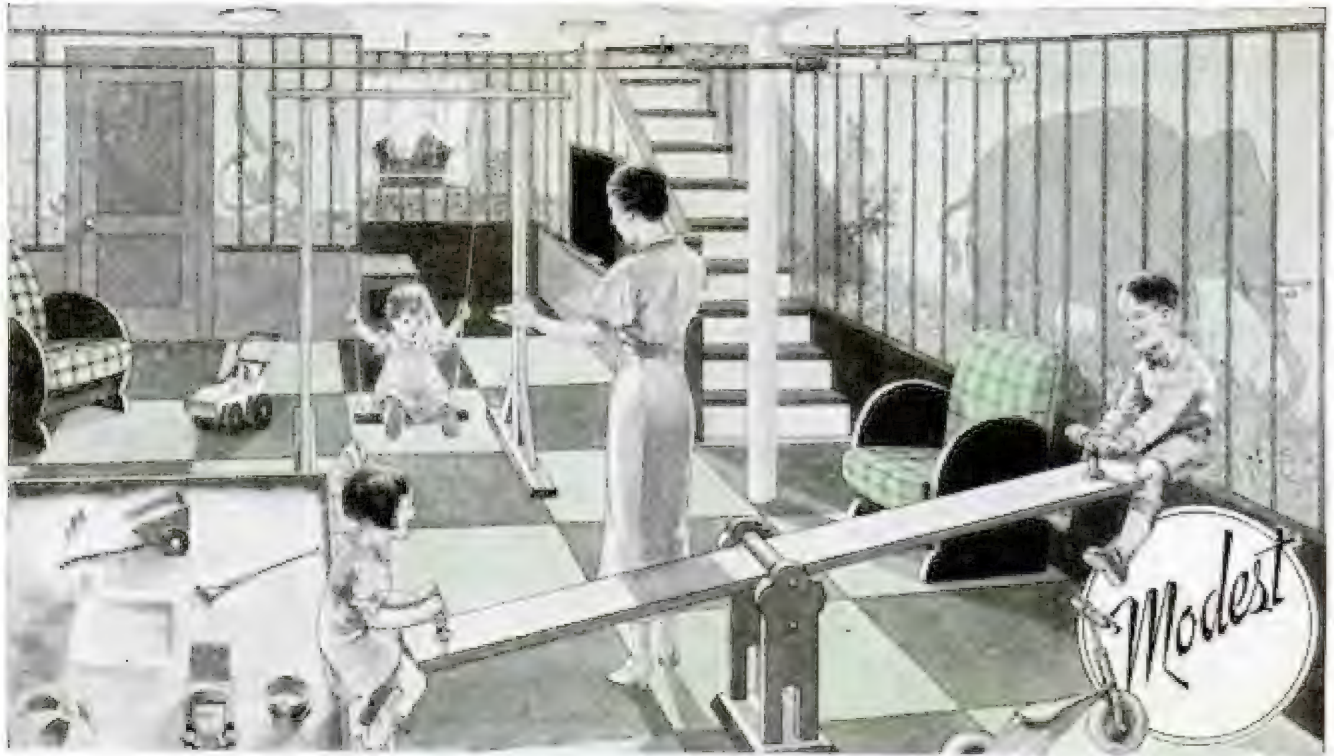


Fitted with rubber-tired casters, this projection stand is easily moved about or stored in a closet when not in use

This sturdy stand may be used equally well for home movie, lantern slide, strip film or opaque projection and, with the projecting apparatus still on top, it can be pushed into a closet. The top tilts to provide adjustments in the heights of the pictures, two lower shelves being provided for holding apparatus, slides, reels, etc. Tight tenon joints well glued make for strength, and soft wood can be used for the framing, but the top should be constructed from hardwood or heavy plywood to withstand warping. If desired, it can be covered with two strips of auto running-board rubber, which will help prevent the projector from slipping. Two strips of flat steel are used for holding the top when raised. One end of each is bent at right angles for screwing to the underside of the top, and the long arm is slotted for a bolt and wing nut to secure it in varying positions to the side of the frame. The rear end of the top is hinged to the frame. Four large rubber-tired casters complete the job.

—Gilbert Brighthouse, Iowa City, Ia.

from Coal Bins



By R. O. Buck

PART I—Ceiling, Wall and Floor Treatments; also Painting and Ventilating

ONE of the first steps in planning a recreation room is to determine just how much of the basement space you can devote to the purpose and where partitions may be placed to greatest advantage. Unless the basement is small you will probably plan to finish up only a part of it and thus avoid too great an expenditure. The dryness of the basement must be considered also. If the floor and walls are inclined to leak or if water backs up through the drain after a heavy rain, steps must be taken to have these defects remedied before anything in the way of improvements can be undertaken.

Wall Treatments: In most basements the poured foundation is thicker than the wall above ground, resulting in a set-back near grade level. A wainscot effect can be made by finishing up to this line with paint and filling out the depression above with some sheet material. Fig. 1 shows how this can be done on different types of walls. If the walls are smooth they may be finished with paint or calcimine. For ce-

ment or brick walls, a cement-bearing paint is recommended. The steps in applying this material are shown in Fig. 2. Two coats are generally required for good coverage. Paints of this type bond themselves to the wall, thus coloring, waterproofing and preserving in one operation. Cracks must be patched and any oil paint removed with lye or tri-sodium phosphate before painting. Cement paint will not adhere to smooth surfaces such as wood or plaster board. Stains, washable calcimine, plastic paint or the new casein paints are suggested for smooth surfaces. Ordinary inside oil paint is also suitable, of course.

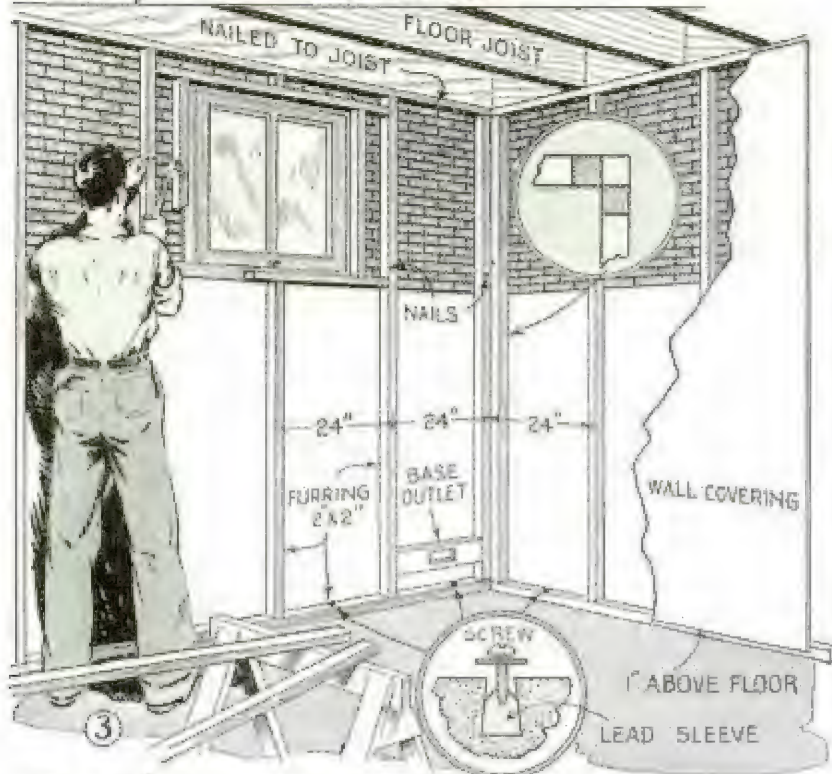
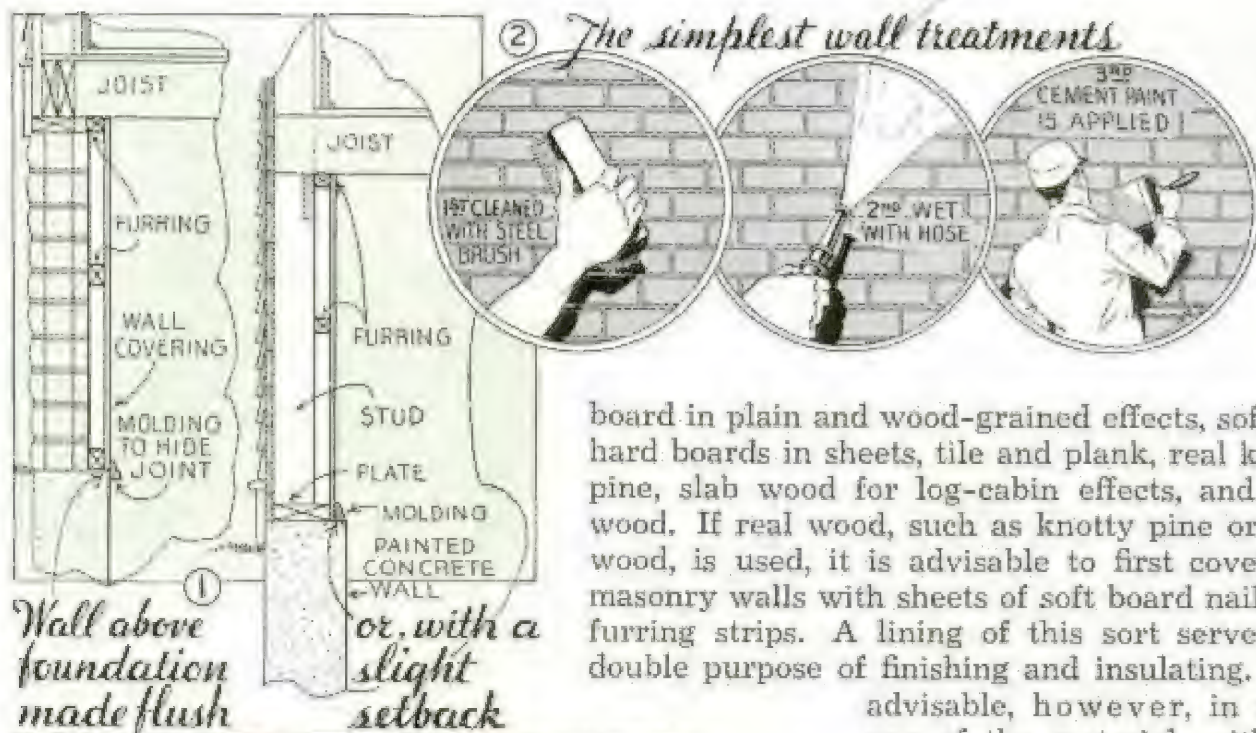
Before proceeding with any wall finish, all openings around pipes, where the ceiling and walls meet, etc., should be closed up with wood or plaster. Unfinished places like this not only spoil the appearance but are causes of heat loss as well. In many cases a complete covering of the walls is more desirable. There is a wide choice of suitable materials to choose from: Plaster



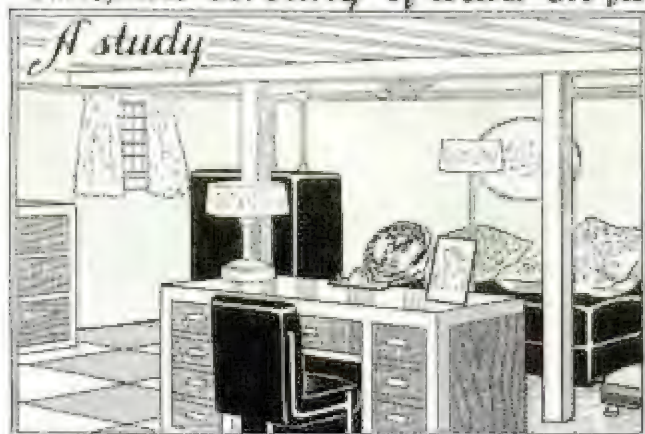
to Play Rooms



Whether you want something modest or elaborate, there are all kinds of interesting treatments for basements to transform them from mere storerooms and coal bins to splendid recreation rooms. On this page, the nautical motif gives a spacious effect. Awning and rails are real, the window resembles a porthole, while the lifeboat, funnels and background are painted on the walls. Basements, heated and ventilated to dispose of dampness, make ideal playrooms for the children too, providing plenty of space for miniature swings, seesaws, sand boxes and other playground equipment. For scenic effect you can paint animals on the walls and nail on molding strips to represent a cage



Complete covering of walls on furring



board in plain and wood-grained effects, soft and hard boards in sheets, tile and plank, real knotty pine, slab wood for log-cabin effects, and plywood. If real wood, such as knotty pine or plywood, is used, it is advisable to first cover the masonry walls with sheets of soft board nailed to furring strips. A lining of this sort serves the double purpose of finishing and insulating. It is

advisable, however, in using any of the material, with the exception of hard-pressed board, to start the sheets an inch above the floor and not less than $\frac{3}{4}$ in. from the wall. Walls which are difficult to nail to are furred in the manner shown in Fig. 3. It is excellent practice to paint the entire wall behind the board with asphaltum or tar if it is at all porous. Either of these materials is inexpensive and easily applied. Wall panels may be set either vertically or horizontally. The former accentuates the height of the ceiling and the latter gives an air of spaciousness. You need only decide which effect you desire. Large sheets of wall material are readily nailed into place as in Fig. 4.

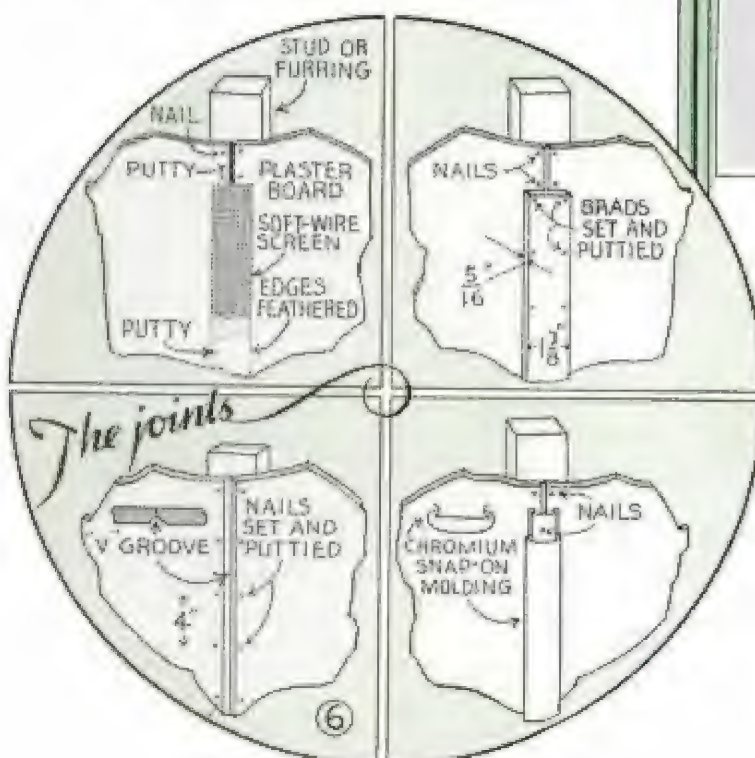
Right here it's well to remember that if you plan on a ceiling covering, this should be applied first. Partitions must be framed solidly to prevent undue vibration when doors are closed. Heavy framing also prevents the joints between the wall sheets from opening. Fig. 12 shows a typical example of partition framing. The installation of wiring and boxes for light outlets should not be overlooked before finishing walls and ceilings as these are much easier to locate beforehand. The four standard methods of covering joints between sheets of wall-covering material are shown in Fig. 6. Choose the one that fits in best with the type of room contemplated. Boards come with plain edges and lapped and V-lapped joints. The latter two types are shown in Fig. 5.

Ceiling Treatments: If your basement ceiling is plastered, it will require only calcimining or painting. For exposed floor joist a number of treatments are possible, depending on the type of room you want and the amount of expense you wish to go to. For ship deck or exterior motifs, striped canvas may be hung from the ceiling to conceal the joist and carry out the scheme in the manner shown in Fig. 11. Soft-pressed board in one of the stock patterns shown in Fig. 8 makes an unusually attractive ceiling and one easily applied. It is simply nailed to furring strips as shown

Covering with large sheets, or ----



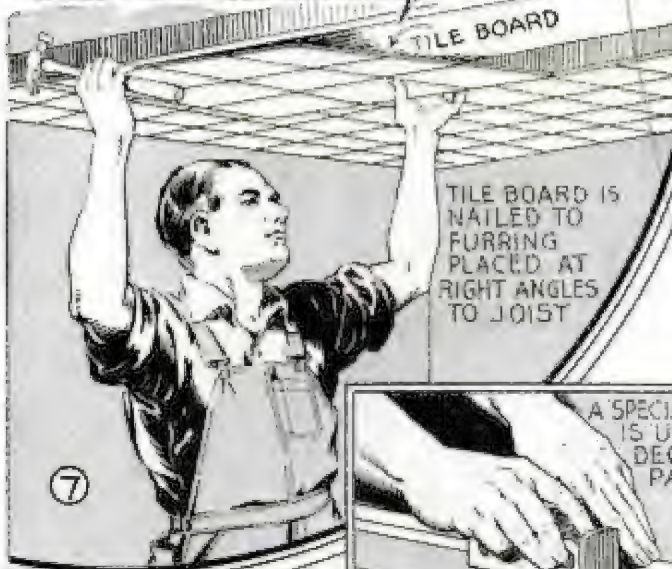
with narrow vertical strips



in Fig. 7. A variety of stock moldings, made of the same material as the soft-pressed board, are available to produce panel effects, cover joints, round corners, etc. Ornaments to use as medallions for light fixtures and head caps on pilasters may be selected from these materials. As an example, an attractive room in the nautical vein is shown in the heading. Here large sheets of hard board are nailed to the ceiling and walls and the joints covered with 5-in. strips of the same material. Imitation rivet heads of wood (screw-

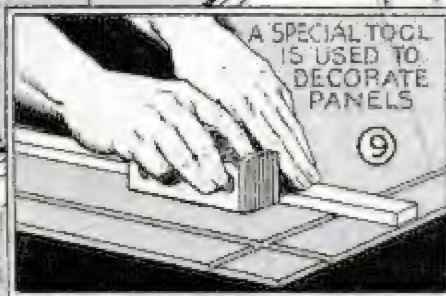
9/9/37
Michigan
Chicago

-and now the ceiling-



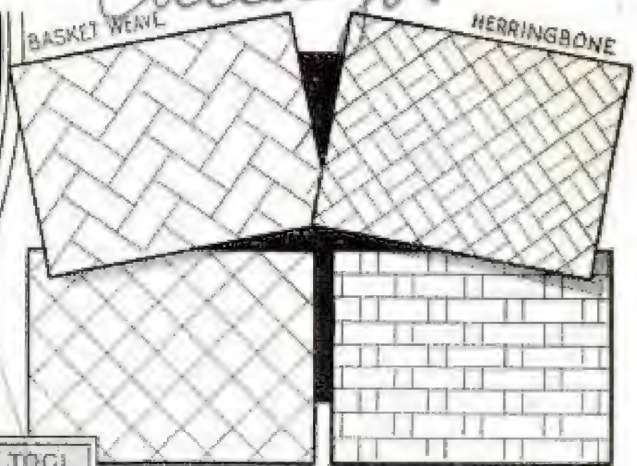
TILE BOARD IS NAILED TO FURRING PLACED AT RIGHT ANGLES TO JOIST

⑦



A SPECIAL TOOL IS USED TO DECORATE PANELS

⑨

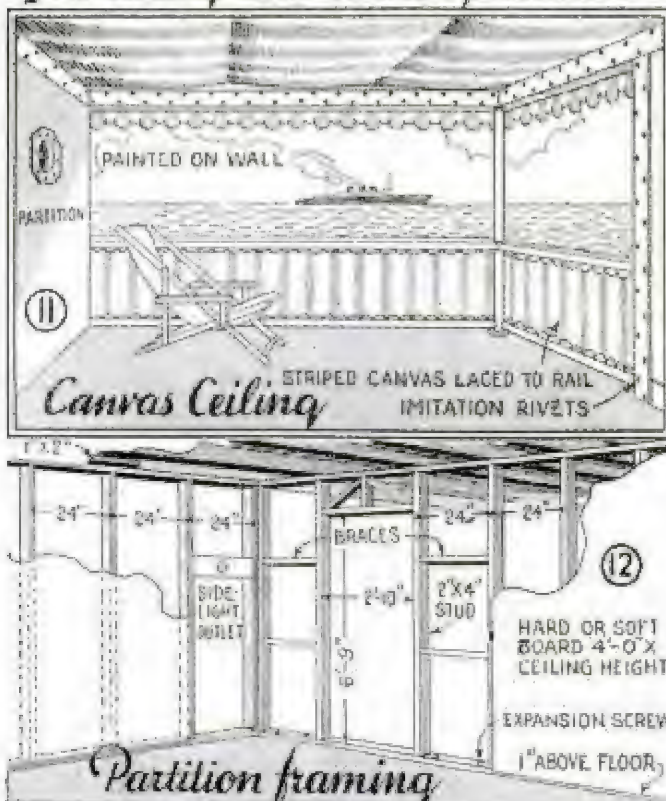


DIAMOND COMBINATION ASHLAR
TILE-BOARD PATTERNS ⑧



⑩

Tile ceiling with arched partition



⑪

⑫

hole buttons will do) are nailed or glued to the strips at intervals. The entire walls and ceiling are painted white. Most wall-covering materials can be used either unfinished or decorated with paints, calcimine or varnishes.

Soft board may be decorated in a variety of patterns by means of a special tool which can be purchased or borrowed from dealers in this material. An inexpensive type of this tool, equipped with a V-cutter, is shown in use in Fig. 9. Cutters to make reeds, flutes and bevels are also available. The ceiling illustrated in Fig 10 is one example of decoration by means of this type tool.

A novel and inexpensive method of covering an unsightly ceiling or wall is produced by using poultry netting and muslin. The wire is simply stretched over the joist or furring, then covered with yard-square pieces of a cheap grade of muslin which has been soaked in a thick solution of laundry starch. The material is fastened to the netting with thread and when the starch has started to set, pushed in or raised between the mesh to produce a rough wall effect. A little experimenting may be necessary to get just the effect desired. When the material becomes rigid, it may be calcimined or painted with casein paint, then highlighted with a lighter shade. Though not essential, a spray gun will be found very convenient for this work.

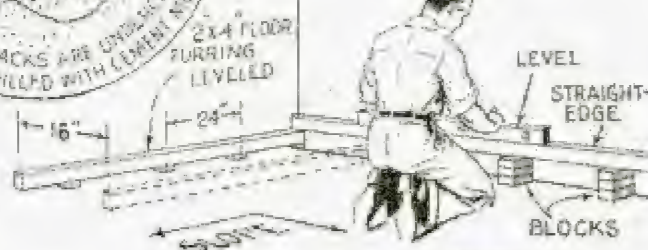
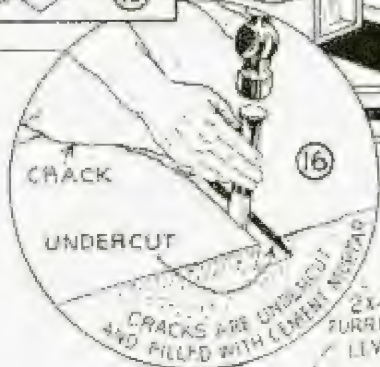
Floor Treatments: Now, with the walls and ceiling finished, the next problem is to find a way to make the floor attractive. Painting, if correctly done, with proper materials and preparation, is a

Finally the floor ~~~~~



very satisfactory and inexpensive way of finishing the floor. Unfortunately, however, many painted floors turn out badly, due to dampness and alkali in the cement, which softens and discolors the paint. Grease from soapy water, generally found around laundry tubs, is also a frequent cause of paint failure. The floor must be cleaned thoroughly before painting. Flushing off with water alone is not sufficient. The surface must be scrubbed thoroughly with a grease-dissolving compound, such as tri-sodium phosphate, until all grease and paint are removed, as in Fig. 13. Follow the scrubbing with a final rinse of hot water. Cleaning and filling the cracks is next. The larger cracks should be chipped back and undercut, as shown in Fig. 16. All cracks are filled with a mortar consisting of cement, 1 part, sharp sand, 2 parts. After the surfaces of the crack have been thoroughly wet, the mortar is pressed into the opening and leveled with a small trowel.

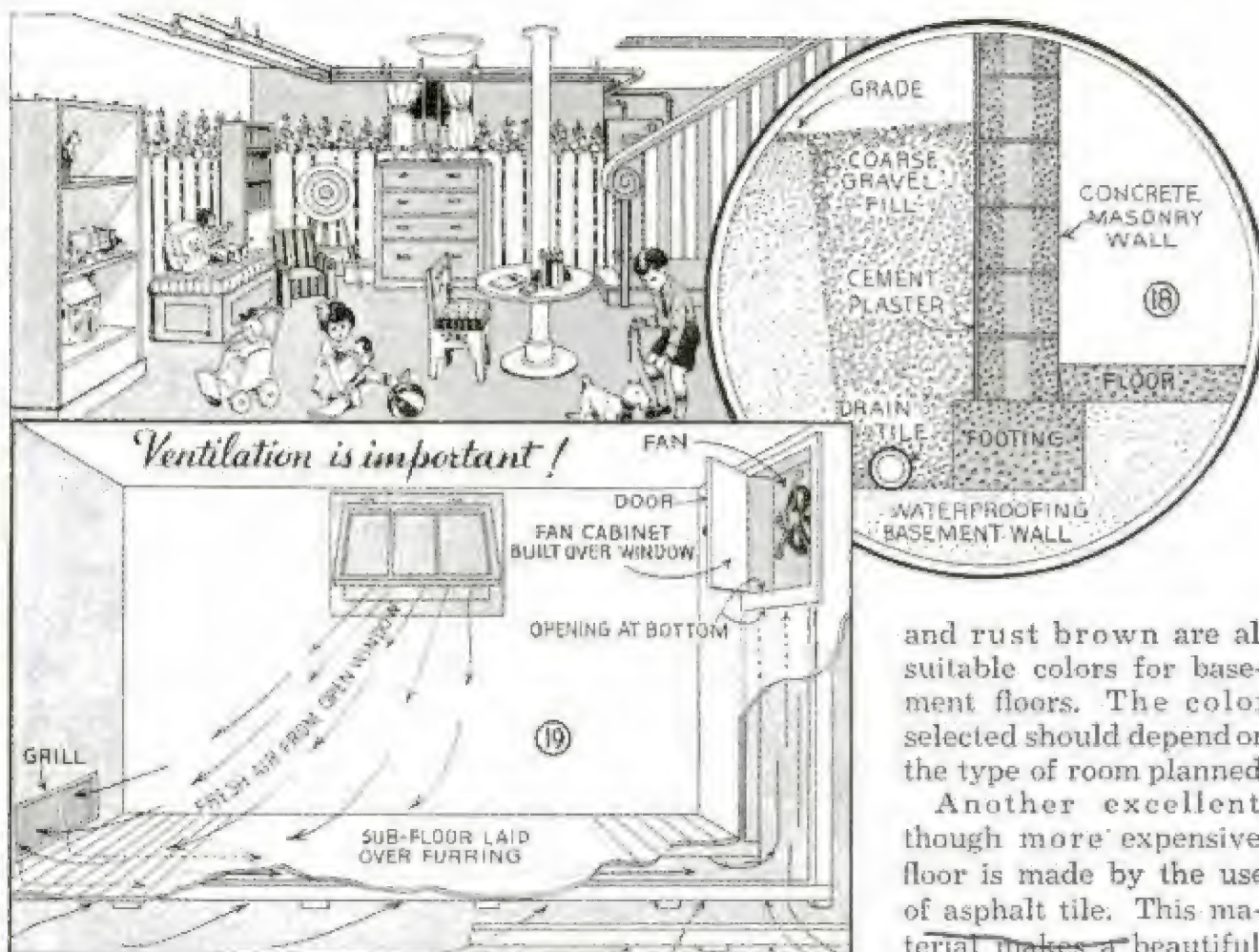
The presence of active alkali can be determined by making a simple test with the solution shown in Fig. 15. Pour a few drops on the dry floor in several places as in Fig. 14. If the spots turn pink, alkali is present. However, if the above test is negative, any of the paints that are especially made for concrete floors may be used safely, if applied according to the manufacturer's directions. Remember that



*Furring strips
are leveled
with blocks*



no floor paint can be applied over a damp surface. Painting during the season when the heating plant is in operation, is strongly recommended. Painting floors less than a year old is not advisable, but color may be added when a floor is laid, or a topping of colored cement may be applied where the floor remains damp or is in poor condition. On the other hand, if alkali is indicated a primer must be used to seal the floor against dampness and alkali. Several suitable primers are available. A solution of magnesium fluosilicate crystals dissolved in water and painted over the floor two or three times, is effective and inex-



pensive. Mix $\frac{1}{2}$ lb. of the crystals with a gallon of water for the first application, then increase the quantity of the crystals to 2 lb. for succeeding coats. Copper-bearing primers make an effective seal and may be followed with two coats of an especially prepared phenol-formaldehyde paint which produces an extremely hard surface having exceptional wearing qualities. Powder types which mix with water are also good. A mixture containing an iron compound is often used but must be followed by a coat of shellac or aluminum paint before applying the color coats, to prevent the iron from "bleeding" through. Floor paints consisting principally of rubber hydro-carbon produce extremely hard and long-wearing surfaces that are unaffected by alkali. When applying this material, the floor must be cleaned thoroughly, as previously described, and in addition washed with a 10-per-cent solution of muriatic acid, which is allowed to remain on the floor for 15 min. before rinsing off with water. Cement paints are available in a great many pleasing colors. Neutral gray, tile red, hunter's green, navy blue

and rust brown are all suitable colors for basement floors. The color selected should depend on the type of room planned.

Another excellent, though more expensive, floor is made by the use of asphalt tile. This material makes a beautiful, waterproof floor that will

withstand hard usage. The tile is available in a variety of colors and sizes so that very attractive color combinations can be worked out. An idea of the effect produced by alternate dark and light tile is shown in the illustration at the right of Fig. 14. The material is cemented directly to the concrete floor, which must be dry and free from paint and grease, then rolled and weighted down with sandbags until the adhesive has set. Now a wood floor has a decided advantage if the room is to be used by small children who enjoy playing on the floor, for it is always warm and dry. Also children are less likely to be seriously hurt from falls. Excessive pitch on the cement floor often makes a wood floor desirable, as the latter provides a level surface. The cost of a wood floor is not excessive, especially if the room is small, and wood gives the whole room that warm "up-stairs" feeling. A single thickness, matched pine or fir floor is recommended. The floor should be laid over stringers which may be either 2 by 4 in. or 2 by 2 in., depending on the amount of pitch to the floor. Starting at one corner,

*"Asphalte" Armstrong
Coca Co. 2' long 10"*

level up a stringer by blocking, as shown in Fig. 17, and the illustration above. A variety of blocks of varying thicknesses will be required. The blocks are fastened by toenailing through the sides of the stringers. Now lay a straightedge on the stringer at the corner and at right angles to it, as shown. Block this piece up until it is perfectly level. This establishes the level at which all of the pieces are to be laid. On single-thickness flooring, all joints must occur over a stringer.

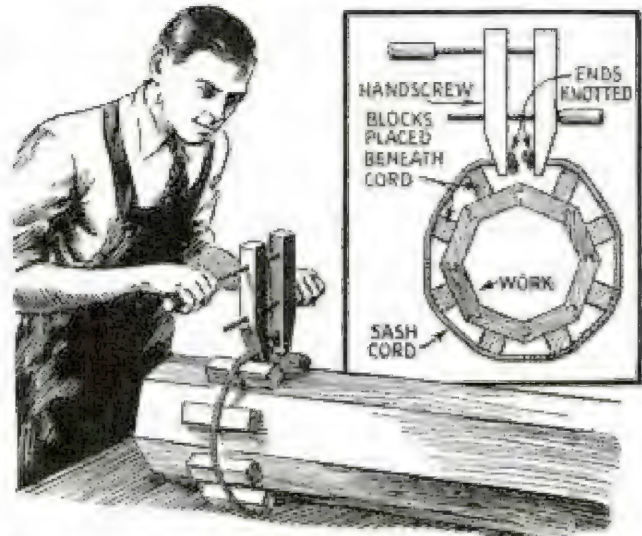
Provision must be made for ventilation under a wood floor. This is accomplished by leaving the ends of the stringers open on the outside of the partition. As the stringers are blocked up from the floor, cross ventilation is also provided. If moisture condenses on the foundation wall, Fig. 19 suggests a method of eliminating this source of dampness by accelerating the normal movement of air with a fan placed in a hood or cabinet built over a window. The cabinet is so constructed that the fan draws out the air under the floor and from between the walls. This displacement sets up a slow movement of air from the room, the air being drawn through grills at the baseboard and down under the floor. Grills are placed on three sides of the basement and about 4 in. above the floor. The arrangement does not produce objectionable drafts when in operation and need be run only at intervals during the summer months when the heating plant is not in operation.

Lastly, if you're troubled with water seeping into the basement due to pressure built up outside the wall, Fig. 18 shows a remedy. Care must be taken to assure ample fall of the drain tile to the storm sewer. The gravel fill should be uniformly coarse, should be at least double the thickness of the wall, and should come clear up to the grade level. In this way both surface water and rising levels of water below grade will be carried away before sufficient pressure can be built up to cause seepage.

(To be continued)

☛ When painting iron railings, grills and similar work where you cannot get at both sides, a hand mirror, when held under or behind the work, will enable you to see if any spots have been left unpainted.

Column Work Clamped Tightly with Hand Screw and Rope

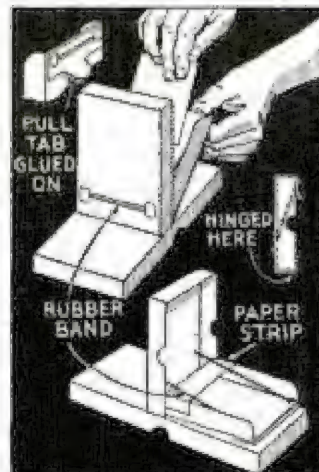


Columns and similar work are easily glued together with this simple clamp

An efficient clamp for use on cylindrical work can be improvised from a common hand screw and a length of sash cord. Holes are drilled in the ends of the clamp jaws through which the cord is inserted and knotted. Tightening the hand screw exerts sufficient pressure on the rope to draw the work firmly together. Blocks of equal size must be placed between the rope and work, of course, to get an even pressure all around.

Container Protects Photo Paper

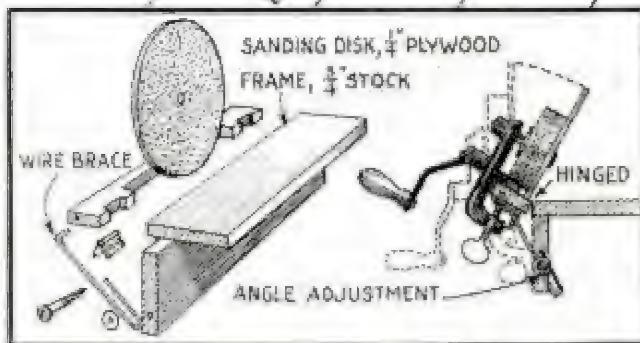
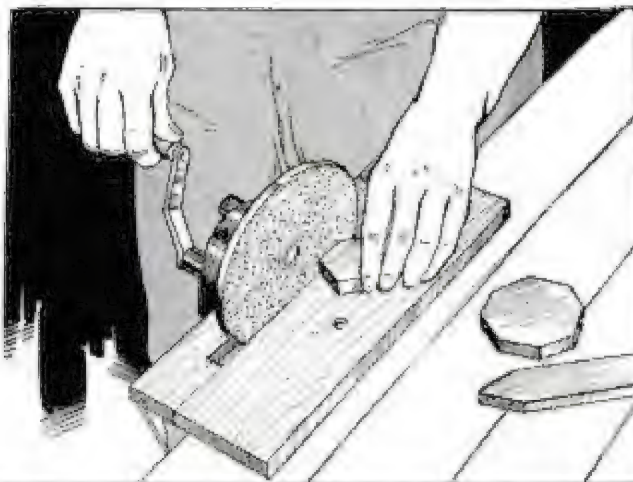
This self-closing container to keep sensitized photographic paper lessens the possibility of accidentally exposing it to light in the darkroom. Made of cardboard, the



container should be of a size to take the largest paper you use. The two halves of the box are hinged together at the bottom, and a piece of gummed paper is placed over the hinged part on the inside as further protection against entrance of light. Rubber bands run

through holes near the bottom of the back and near the top of the lid provide tension to keep the box closed.

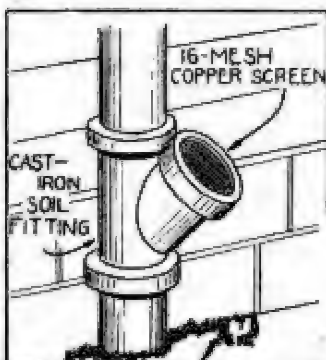
Hand-Operated Bench Grinder Converted to Disk Sander



Light materials such as trimmings and model work are readily handled by this simple sander

A disk sander for small jobs is easily improvised from a bench grinder. It has been found especially suitable for sanding all kinds of trimmings and for model work. No alteration of the grinder is necessary as a plywood sanding disk is merely substituted for the grinding wheel. A right-angle frame is made up as indicated and a recessed strip, to which the grinder is clamped, is hinged to it. The hinged strip is adjustable by means of a heavy wire or rod brace to set the sander at various angles. The assembly is attached to the edge of the workbench with a heavy screw.

Gases Kept Out of Downspouts



In case there is no trap in the sewer drain at the point where conductor pipes connect to it, the escape of corrosive sewer gases often results in rapid deterioration of

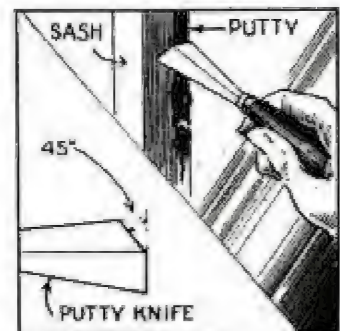
the conductor pipe. To overcome this trouble, I installed a Y-fitting of the soil pipe at the lower end of the downspout, which allowed the gas to escape at this point. The opening in the fitting is covered with copper screen to prevent the entrance of anything that might clog the pipe.—L. H. Georger, Buffalo, N. Y.

Angle Putty Knife Aids Amateur in Glazing Windows

Here is a simple tool that will enable the amateur glazier to do a good job of putting windows. Made of sheet steel not heavier than No.

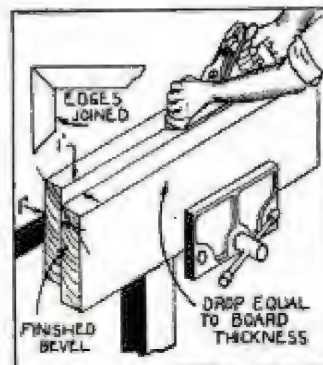
16 gauge, it can be shaped easily in a bench vise, the edges ground a little to remove roughness and the end of the blade inserted in a file handle. With this knife, you can ap-

ply the putty uniformly, do good corner work and complete the job neatly in much less time than it usually takes.



Mitering without a Gauge

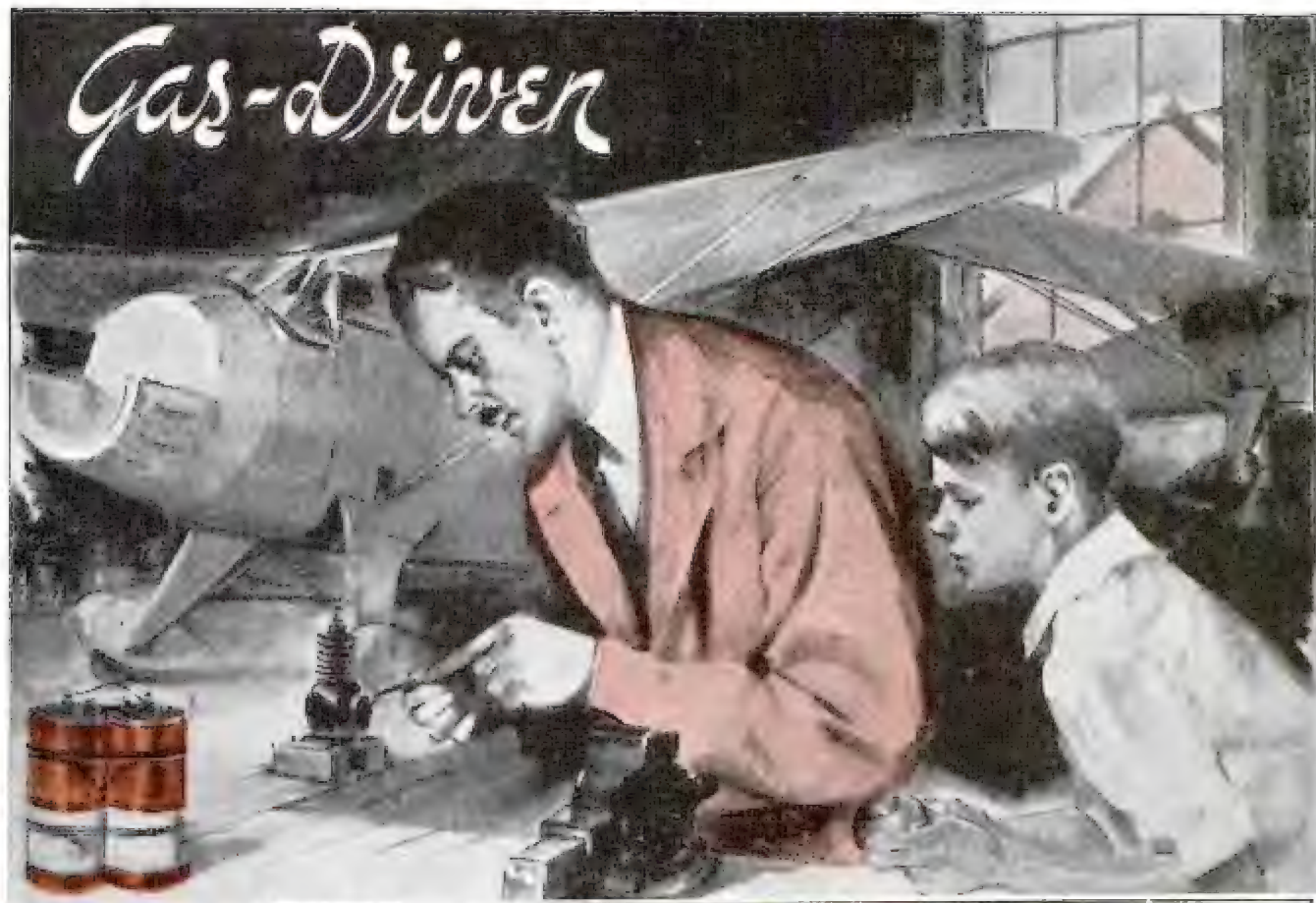
Two boards may be jointed at a 45° angle with an ordinary hand plane by using the set-up shown. The boards are clamped



in a vise with the top edge of one projecting above the other a distance equal to exactly the thickness of one board. Then a guide line is drawn at the end of the work from the rear edge of the projecting board down across the inner edge of the other one. When the stepped edges of the boards have been planed down flush with the guide line, the bevel on each board will be exactly 45 degrees.

❑ Rag rugs will not curl up or slip on waxed floors so easily if they are dipped in a medium starch solution and dried.

no blueprints

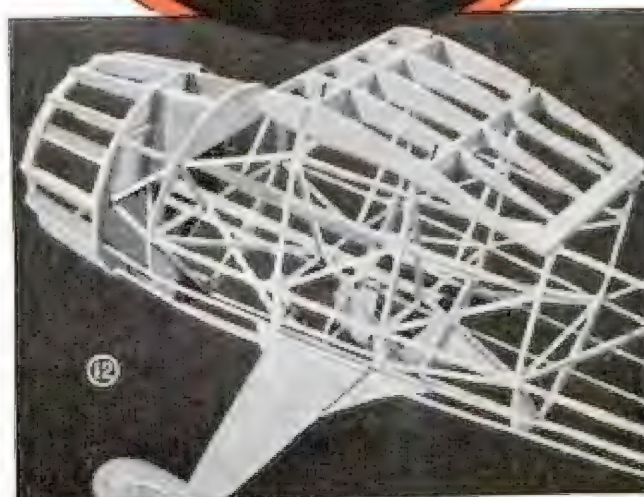
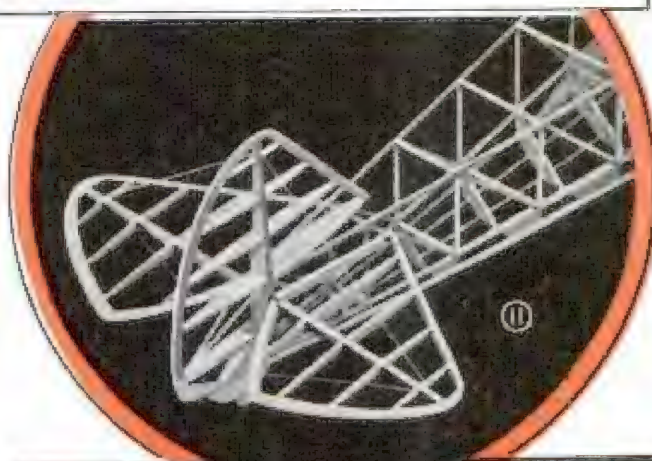


PART II

MODEL PLANE

Rudder—Wings—Covering Motor Installation

TAKING up the fin and rudder next, you sketch a full-size layout of the parts in Fig. 11, leaving a $\frac{1}{8}$ -in. space between the rudder and the bottom part of the tapered fuselage section. To do this, you can refer back to the plan view in Part I. Vertical members of the rudder and fin are tapered from the 1-in. width at the bottom to $\frac{3}{16}$ in. at the top. The leading and trailing edges are assembled first. Then the ribs are put in one at a time and fitted, starting at the bottom and working toward the top, small pins being used to hold the ribs in place until the cement sets. To keep the rudder square, a cross brace is placed from the upright of the second rib to the bottom rib near the trailing edge. After assembling, the parts are sanded to their proper streamlined shape. The rudder and fin are hinged at three points equally spaced with small strips of tin, $\frac{3}{64}$ in. thick and $\frac{1}{4}$ in. wide. These pieces are forced

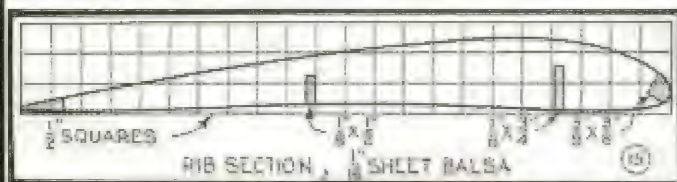
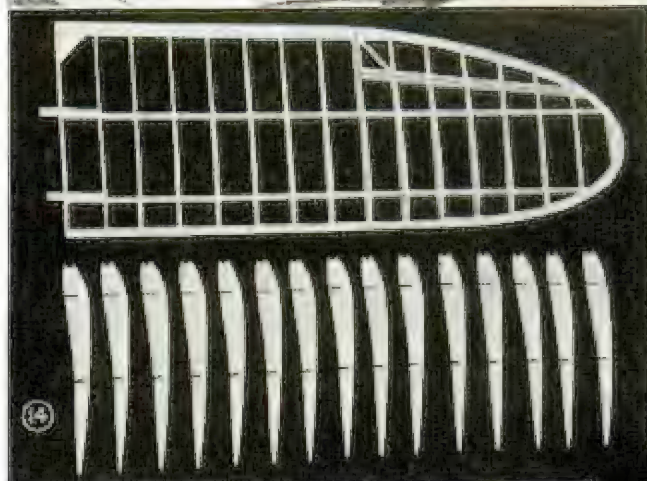




It's a good idea to make full-size layouts on heavy paper of the fin, rudder, ribs and wing panels before cutting the stock. Then you build the rudder and wing panels right over the layout

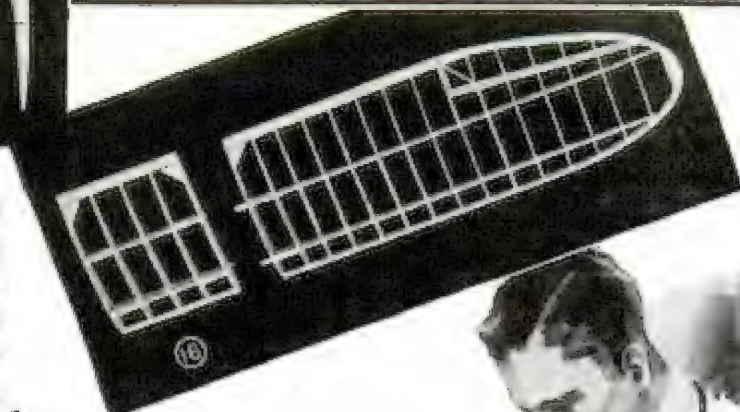
in. The center section, upon completion, is cemented in position against the top longeron on which a cross brace $\frac{1}{2}$ in. high has been cemented to give the wing the correct angle of incidence.

Construction of the wing is similar to the center section and should be assembled over a full-size layout made from the plan view in Part I. Thirteen ribs are used in each panel, Figs. 14 and 16, and are spaced equally with the exception of the last one. The wing tips are cut from flat sheets and assembled in three sections. The front part is cut from $\frac{3}{8}$ -in. stock and the two rear parts from $\frac{3}{16}$ -in. stock. The two ribs near the wing tips are less in height and are tapered to fit when placed in position. Also, the last five ribs are a trifle shorter. When constructing the wing pan-



through the uprights, bent over on the inside and cemented. They are flexible enough to permit bending the rudder either way. The hinge construction of the stabilizer and elevators is the same. The fin, rudder, stabilizers and elevators are covered before they are attached to the body permanently with cement.

Wings and Center Section: A full-size layout of the wing rib should be sketched as in Fig. 13, and this pattern cemented to a block of balsa wood which in turn is sawed to shape, Fig. 15, including the notches for the leading edge, the spars and a part of the trailing edge. A block, $3\frac{1}{2}$ to 5 in. high, will be sufficient. After the outline has been formed, the ribs are sliced off as in Fig. 17. Allow ten extra ribs to cover possible breakage. The center section, Fig. 12, should be constructed first, the end ribs being double thickness, or $\frac{1}{8}$



RIBS ARE CUT FROM SHAPED BLOCK ON THE CIRCULAR SAW

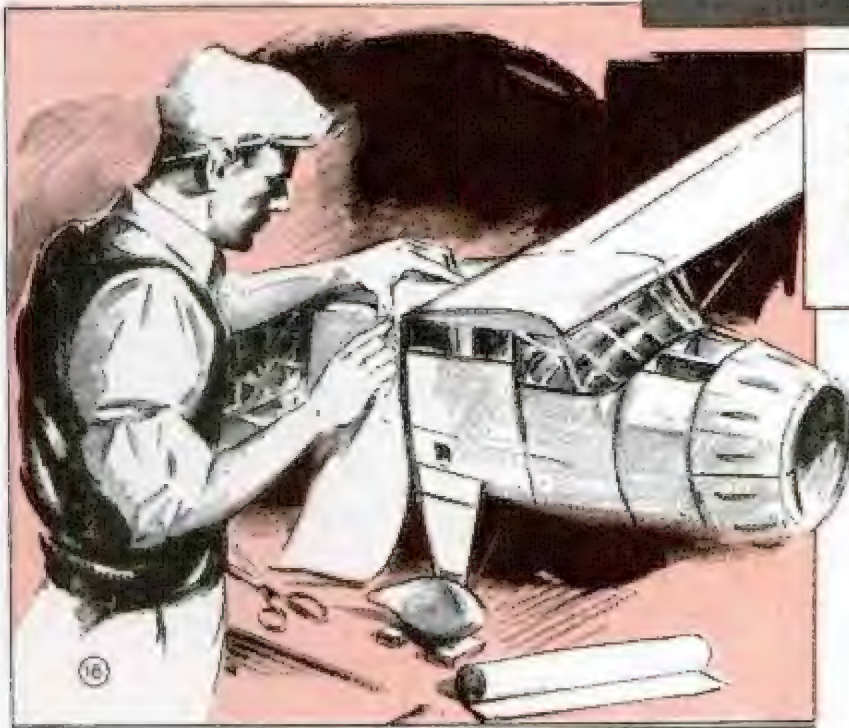


els, be sure to make a left and a right-hand unit. Now, when the parts have all dried, you cut out a section for the aileron, adding a few extra parts to complete this unit. These consist of two additional end ribs and a spar for the front part of the aileron, also a small spar cemented to the wing. The ailerons are attached at three points with small bands of tin, $\frac{3}{16}$ by $\frac{1}{4}$ in.

Wing Struts: The wing struts are made of pine. A 3° dihedral at the wing tips equals about 2-in. inclination for each tip. Although the length of the struts is given, it is advisable to cut and fit the parts with the model partly set up. The metal pieces that hold the wings to the center section are cut from



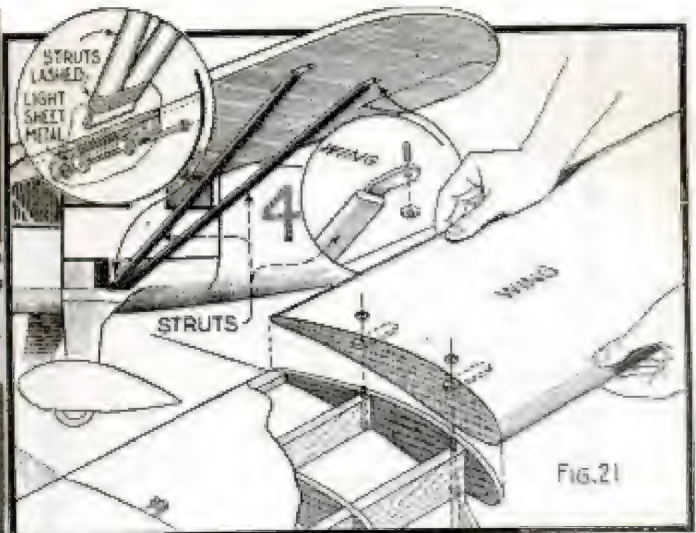
After covering fuselage and wings, the parts are sprayed with water, allowed to dry thoroughly, then given two coats of airplane wing dope. When dry this is followed with a coat of white lacquer applied with a camel's-hair brush



$\frac{1}{2}$ -in. sheet metal, $\frac{1}{4}$ in. wide and $1\frac{1}{2}$ in. long. Bolts are attached to the center section and are both cemented and tied, the threaded ends projecting upward $\frac{1}{2}$ in. Two bolts in each wing project on the underside $\frac{1}{2}$ in. below the wood parts. Triangular blocks of balsa forced against the spar and the rib hold them in place securely. Lugs for strut bolts on the body are attached first to a piece of balsa running across the inside of the fuselage at station 6. This piece is fitted in advance, the bolts attached with lugs which are wrapped with thread and cemented as in Fig. 21. The whole arrangement allows the wings to be detached from the fuse-

lage when the model is being transported.

Mounting the Motor: Now, before continuing, it's best to mount the motor and test it. With the motor in place, the tiny gasoline tank and spark coil are mounted on the body bulkhead as in Fig. 23. Because of the probability of breaking wire connections, make small pig tails leading from the spark plug to the high-tension side of the coil. As three volts are required for operation, two small $1\frac{1}{2}$ -volt flashlight cells are soldered together in series with long wire leads soldered on. The leads go through the body and to the outside between stations 4 and 5 where a midget radio jack is used to break the circuit. The dry cells are located to the rear of station 8 in a balsa-wood box, made sufficiently large to permit wedging the batteries firmly in place. A trap door allows entry to the battery box as in Fig. 20. Positive and negative leads should be marked on the fuselage for connecting



large dry cells, which are used for starting. The dry cells are connected to the leads with clips and the circuit to the small flashlight cells is so arranged that after the motor has been started, the small cells are cut in the circuit. Then the clips to the large cells are removed and the motor will continue to run. The exhaust pipe is lengthened with thin sheet metal so that

it reaches through to the outside of the motor cowl. The motor should be thoroughly checked, using both the external dry cells and the small ones. All of these small motors are of the two-cycle variety.

Material List

STABILIZER AND RUDDER

- 4 Spars, balsa, $\frac{1}{8} \times \frac{3}{4} \times 24$ in.
- 4 Ribs, balsa, $\frac{1}{16} \times 2 \times 24$ in.
- 2 Leading Edge Spars, balsa, $\frac{3}{8} \times \frac{3}{8} \times 24$ in.
- 2 Trailing Edge Cut to Curve, balsa, $\frac{3}{16} \times \frac{3}{8}$ in.

WING MATERIAL

- 3 Leading Edge Spars, balsa, $\frac{3}{8} \times \frac{3}{8} \times 24$ in.
- 3 Front Spar, balsa, $\frac{1}{8} \times \frac{3}{4} \times 24$ in.
- 3 Rear Spar, balsa, $\frac{1}{8} \times \frac{1}{2} \times 24$ in.
- 3 Trailing Edge, balsa, $\frac{3}{16} \times \frac{3}{8} \times 24$ in.
- 2 Wing Tips, Front, balsa, $\frac{3}{8} \times \frac{3}{8}$ in., cut to curve
- 2 Wing Tips, Rear, balsa, $\frac{3}{16} \times \frac{5}{8}$ in., cut to curve
- 30 Ribs, balsa, $\frac{1}{16} \times 1\frac{1}{2} \times 11$ in.
- 10 Sets Bolts and Nuts, iron, $1 \times 2/56$ in.
- 10 Lugs, iron, $1/32 \times \frac{1}{4} \times \frac{3}{4}$ in.
- 4 Struts, pine or basswood, $\frac{1}{4} \times \frac{1}{2} \times 24$ in.

MISCELLANEOUS

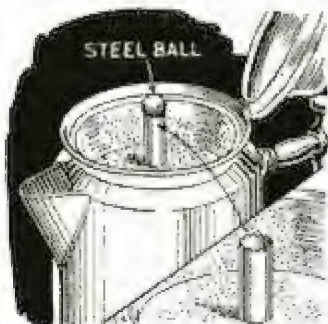
- 1 Windshield, heavy celluloid, 12×12 in.
- 1 Battery Box, balsa, $1/16 \times 3 \times 12$ in.
- $\frac{1}{2}$ pt. White Lacquer
- $\frac{1}{2}$ pt. Quick-Drying Model Airplane Cement
- $\frac{1}{2}$ pt. Dope
- 12 Sheets heavy bamboo fiber paper, 15×20 in.
- Black Tissue for numbers and control outlines, cut to size
- 1 Motor and 15 in. Propeller, small bore, less than 1 in.
- 1 Ignition Coil, 3 volt, 3 oz.
- $\frac{1}{2}$ oz. 400-volt Condenser

Covering: Heavy bamboo-fiber paper is used for covering. Between five and ten sheets are required, the number depending on the size of the sheets. The paper is fastened in place as in Fig. 18, with model airplane cement. All the separate units are

covered and sprayed with water, allowed to dry and then given two light coats of standard airplane "dope," followed with a coat of white lacquer as in Fig. 19. Hand-holes are arranged on each side of the hot-air vent behind the motor cowling on the top side of the fuselage or directly in front of the celluloid windshield. This is the best place to hold the model while starting. The rudder and stabilizers are braced with heavy thread. Decorations such as No. "40" placed on the fuselage sides and "NR-273Y" placed one underneath the left wing and another on top of the right wing as in Fig. 19, help to complete the job. Black tissue paper, $\frac{1}{8}$ in. wide, is used to outline the controls. This is also carried around the windows and windshield and a $\frac{1}{16}$ -in. strip is cemented around the body at stations 4, 5 and 7.

Preparing the Model for Flight: After checking all the parts and having the motor in running condition, a suitable field is selected for the first trial flights. The weather should be perfectly calm, early morning or late evening being the best time. Fill the tank with $\frac{1}{2}$ oz. of gasoline as in Fig. 23, attach the external dry cells, crank the motor, and select a hard runway. It is advisable to have an assistant on hand so that when the model is started, the two persons can follow along with the model near the wing tips to see that it is in perfect balance before allowing it to continue on its first flight. Gas models are not as a rule launched by hand. They are permitted to run along a runway just as the large ships. If the balance does not appear to be correct, adjustments can be made before the model gets out of hand.

Percolator Improved with Ball



ball deflects the rising hot water over the coffee uniformly so that all of it is wetted at the same time, thus none is wasted.

One woman claims that by serrating the top of her percolator tube with a three-cornered file and placing a $\frac{1}{2}$ -in. steel ball on top of it, she can improve the coffee. The

Slip-Proof Ladder for Climbing Poles and Trees



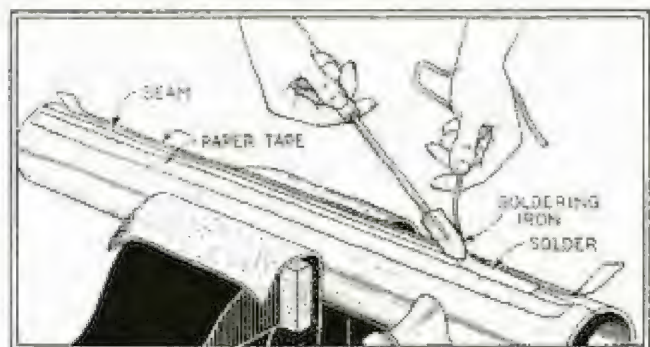
The upper rung of this ladder adjusts itself to the curvature of a tree to prevent slipping

When a ladder is used to climb poles and trees it can be made safe by substituting a length of hose-covered chain for the top rung. The chain fits around the curve of the pole and the rubber hose prevents it from slipping.

—Vernon Tracy, Centreville, N. B., Can.

Tape Aids in Soldering Seams

If you are an amateur at soldering, a couple strips of removable, gummed tape will help you do a neat job of seam soldering. Just place the strips on each side



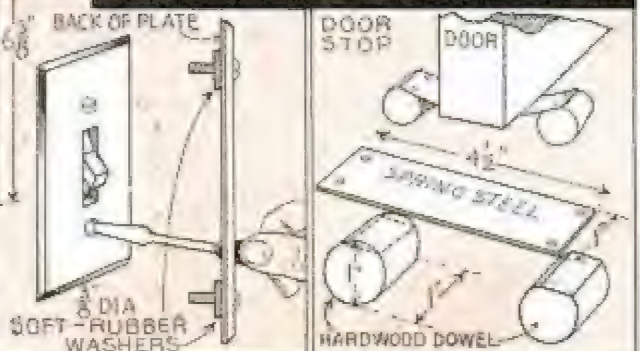
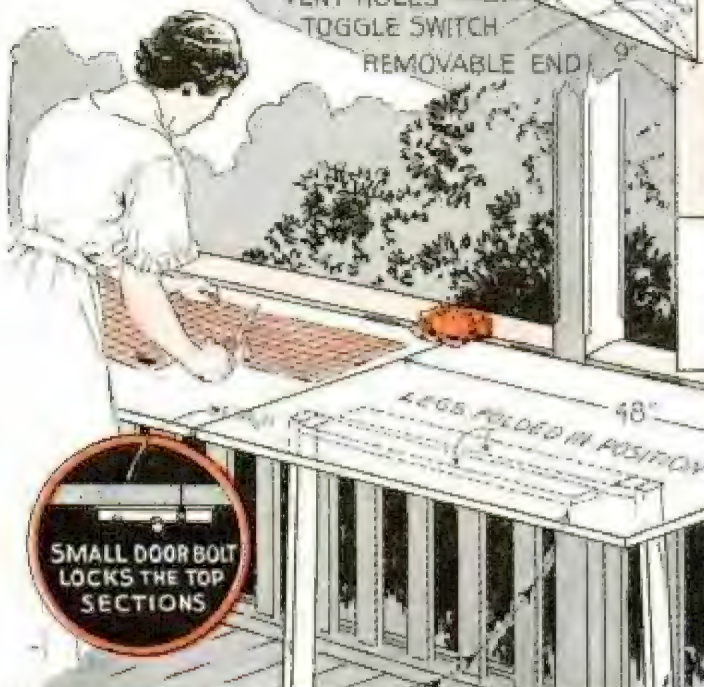
of the seam, leaving the metal bare where the solder is to be applied. This will confine the flow of solder to the bare portion, leaving a neat, straight seam when the paper is removed.

—Richard A. Scott, Kansas City, Mo.



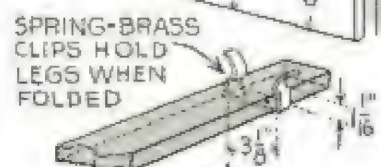
Utilizing corners of the alcove above your kitchen sink and painted to match the woodwork, these fixtures give a diffused light which is easy on the eyes. For replacing the 40-watt bulb, the outer end of each fixture should be removable. The ends may be fastened in place with "drive" screws or with small machine screws and nuts. Place a sheet of asbestos between the fixture and the cabinet. If desired to have one switch control both lights, wire the lamp sockets in parallel. Vent holes in the housings allow the heat to escape

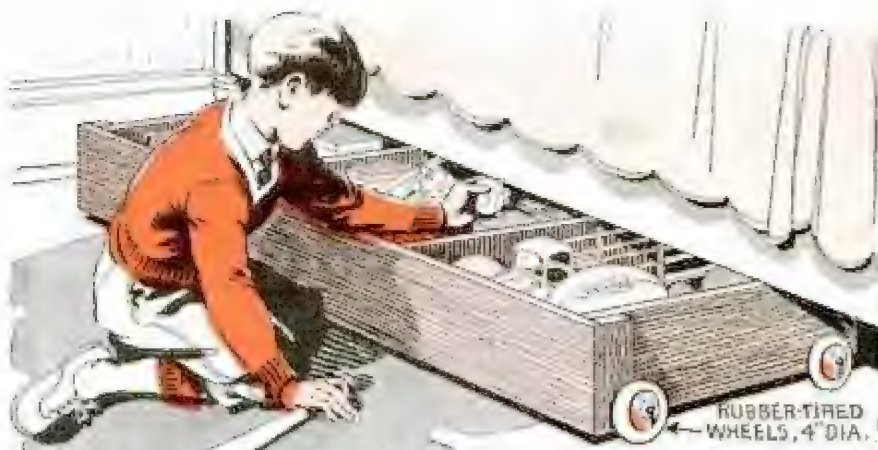
Easy Solutions HOME



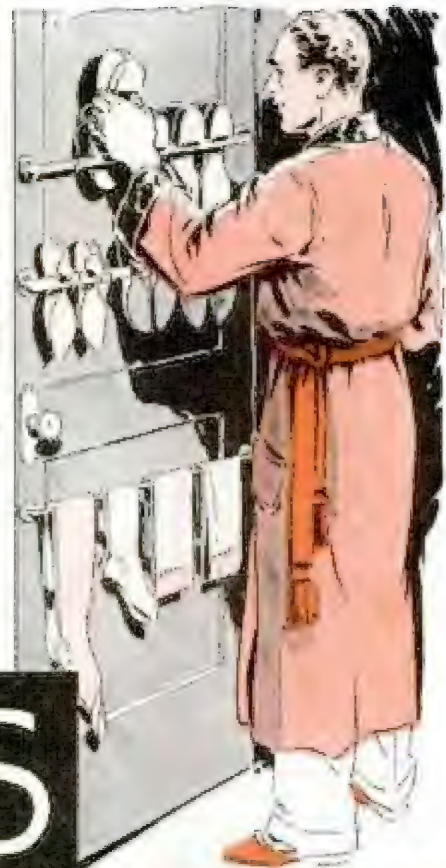
Tightening glass switch plates on rubber washers prevents breakage. A piece of spring steel screwed to short lengths of dowel makes a non-slip doorstop

You'll use this "table" all summer long. It hinges to the porch railing, can be built in as many sections as you need, and best of all, it's rigid. It folds down against the railing, taking up no more space than the thickness of the top and can be set up in an instant, ready for use. The top is made of 3/4-in. plywood



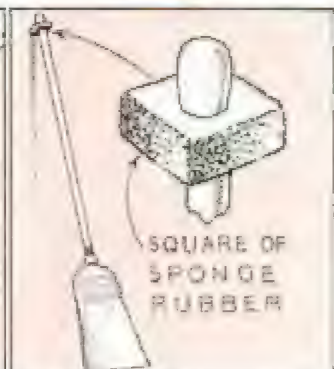
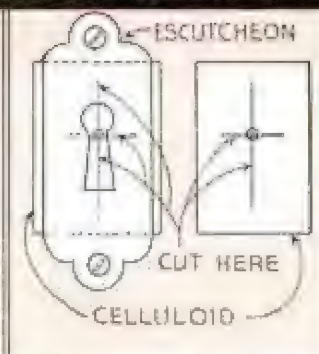
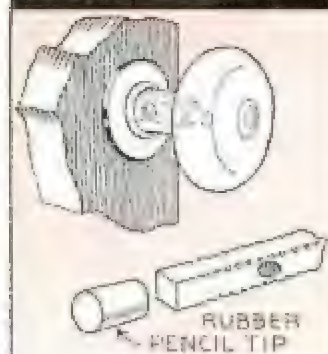


Here's Junior's "place for everything," a long, shallow box on rubber-tired wheels, the right height to roll under the bed. Right, handy racks for shoes and hosiery, by screwing curtain rods to the closet door



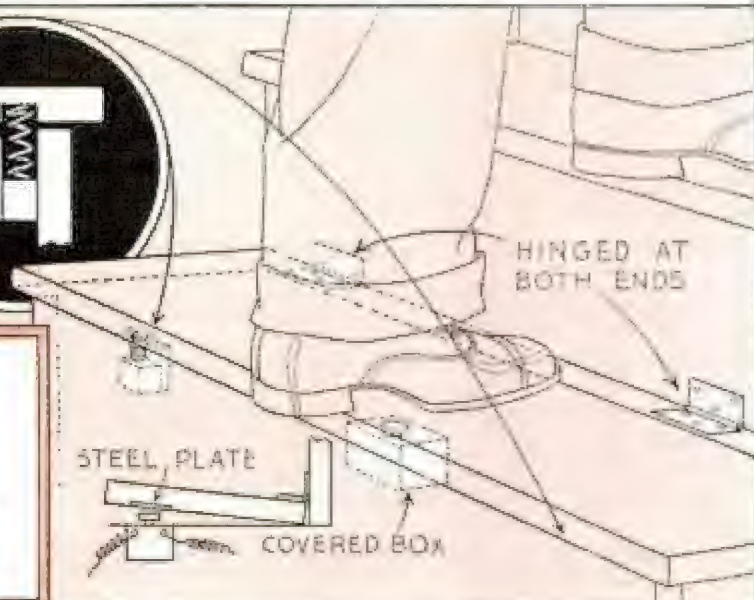
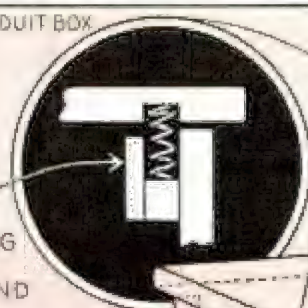
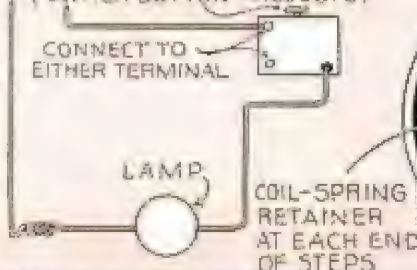
for Your

PROBLEMS



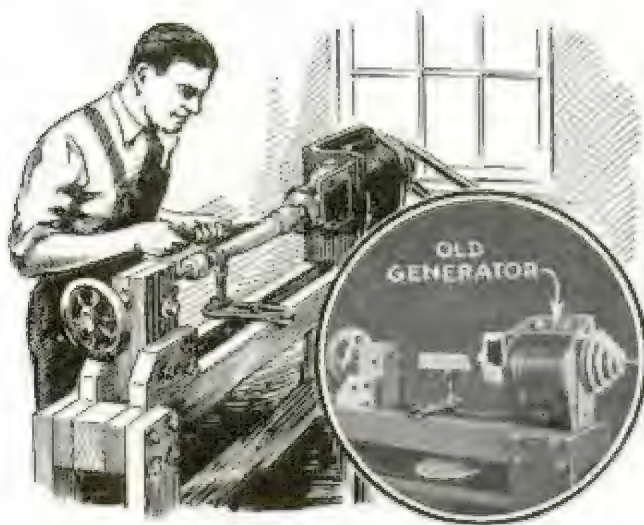
Left to right above—a rubber pencil tip will silence a loose doorknob and a thin sheet of celluloid, slit as shown and placed under the escutcheon, keeps the key in place. To have the soap handy in the shower, sew a pocket to the curtain. A square of sponge rubber keeps a broom upright

AUTO DIM & BRIGHT SWITCH IN CONDUIT BOX
(SWITCH BUTTON PROJECS)



You won't forget to turn off the basement light when you install this switch. The hinged step, when depressed, operates a switch which puts the light on and off. Notice particularly that the switch is mounted inside a conduit box and must be adjusted for proper action

Ball-Bearing Headstock for Lathe from Old Car Generator



If you want to assemble a homemade woodturning lathe, an old Delco-Buick

combination starting motor and generator will solve the problem of obtaining a good headstock. See that the bearings are in good condition and then remove the pinion, brush holders and field coil. It is also a good idea to remove the armature windings and commutator unless a flywheel effect is preferred. One end of the motor shaft is turned down to take a spur center and faceplate, and the other end is fitted with a 4-step pulley. It will be necessary to purchase a bearing to take the end thrust of the work. The ball bearing at one end of the headstock is packed with grease before assembling and an oil hole is drilled through the casting to lubricate the roller bearing at the other end. The top of the generator is already flat so that it needs only to be clamped to the lathe bed to complete the job.

—Ralph L. Kunau, Sabula, Ia.

BUILD YOUR BOAT THIS WINTER

so it will be ready to launch next spring when the boating season opens. The photo shows "Hi-Ho," a 14-ft. family runabout, driven by a 11 to 22-hp. outboard, or converted model-T Ford motor. Six prints giving complete constructional details will be sent postpaid for \$1.00.



OTHER BOATS

- "Roamer"—765 to 770: Outboard cabin cruiser; two berths. Six prints \$1.00.
- "Sea Saucer"—893: 9½-ft. sail boat. Deck, bottom and sides are 3/16-in. plywood. 25c.
- 17-Ft. Kayak—928 and 929: Light framework covered with canvas. Two prints 50c.
- 12-Ft. Utility Rowboat—707: Flat bottom. Four seats. Sturdy design. 25c.
- 16-Ft. Canoe—811 and 812: Cedar planking covered with canvas. Two prints 50c.
- "Arrowhead" Sloop—944 to 951: Fast sailboat 21 ft. long, 5 ft. 11 in. beam. Set of 8 prints \$1.50.

1937 "WHAT TO MAKE"

This 96-page Craftsman's Guide is just crammed full of practical information and valuable reference data for workshop owners. It not only suggests hundreds of items that you can make, but also tells where to purchase hard-to-get supplies. Will be sent postpaid on receipt of 15c, in U. S. stamps or money order.



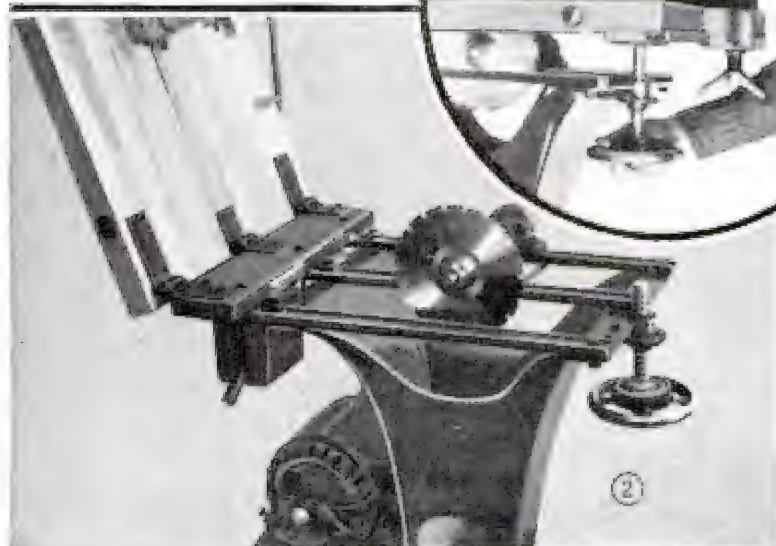
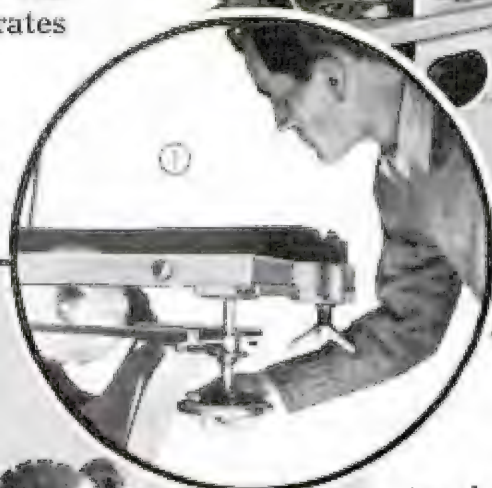
POPULAR MECHANICS MAGAZINE, 200 East Ontario Street, Chicago



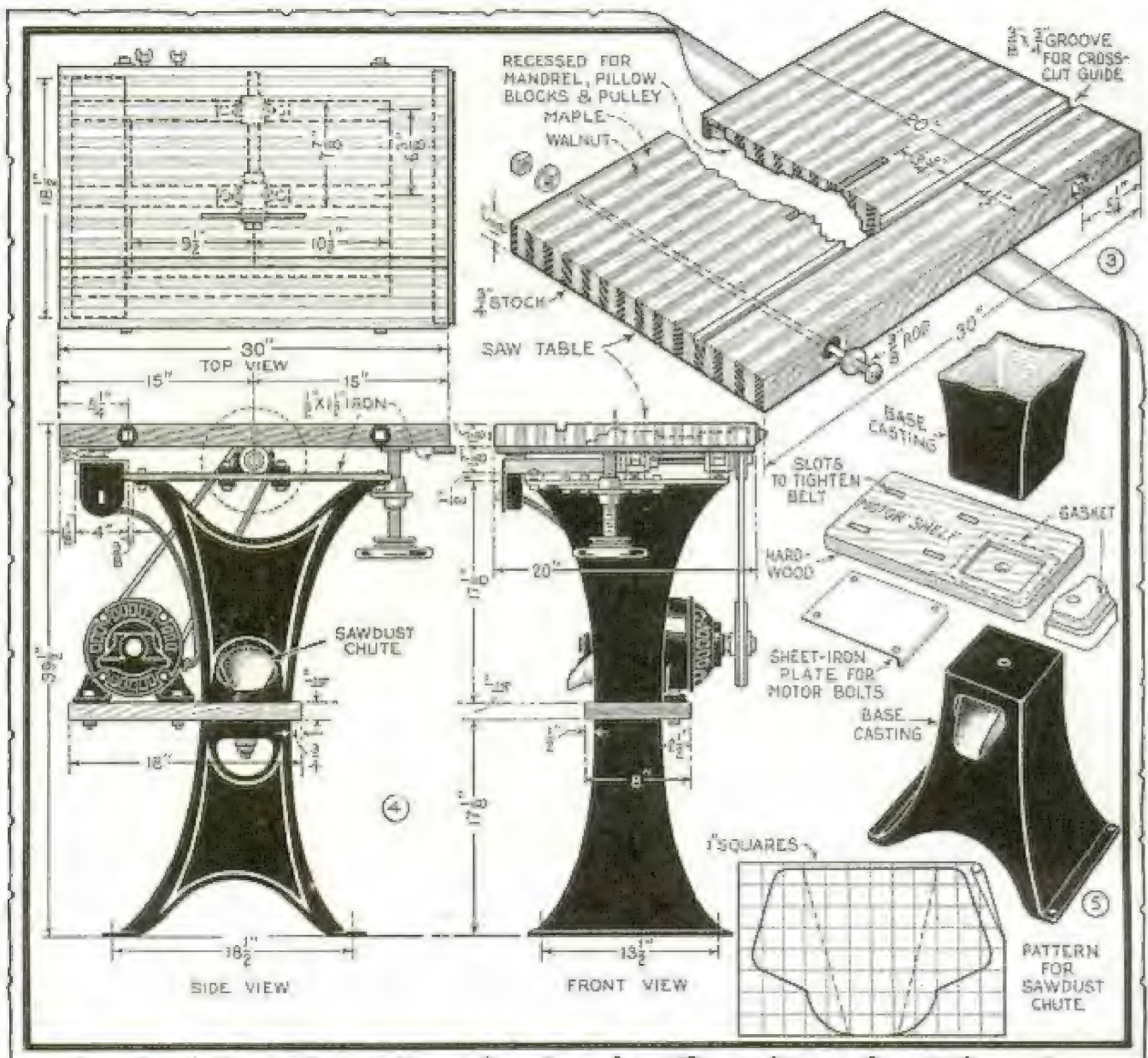
Power-Driven TABLE SAW *you can build*

By Ralph L. Kunau

AT FIRST glance you'd think this table was a commercially built machine, but it isn't; it's a homemade job throughout, except, of course, the motor and saw mandrel. The large table raises and lowers with a threaded hand screw as in Fig. 1, giving you a fine dado and depth adjustment. The full-length rip fence can be set true with the saw blade and locked at both ends. An automatic blade guard operates in the conventional manner. Fig. 2 shows how the table swings up off the frame, giving access to the mandrel for chang-



ing the blade. Now let's see how easy it is to build it. The pedestal consists of two bases of old cream separators, only the lower half of each separator base being used. Both the halves must be from the same make of separator so that when the top half is inverted as in Fig. 4, the bolt holes will register. When you have the base castings, the first thing to do is saw off the

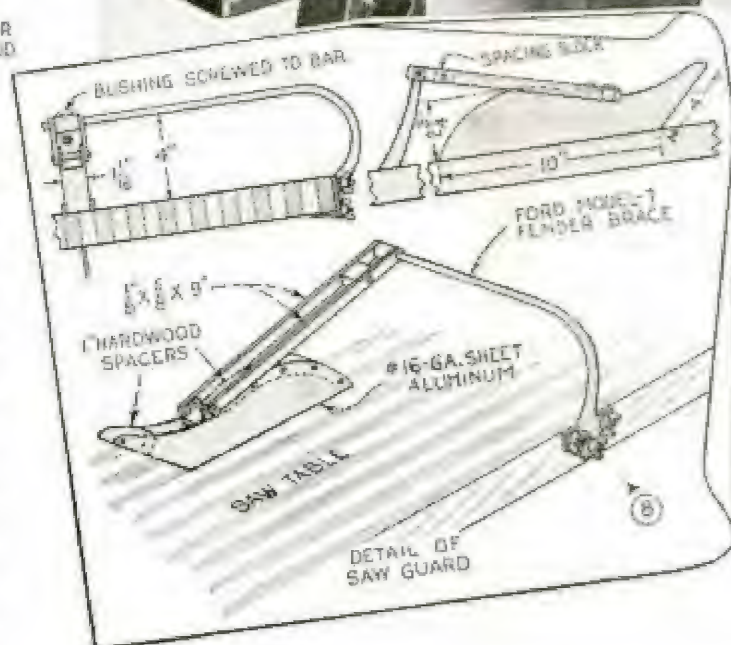
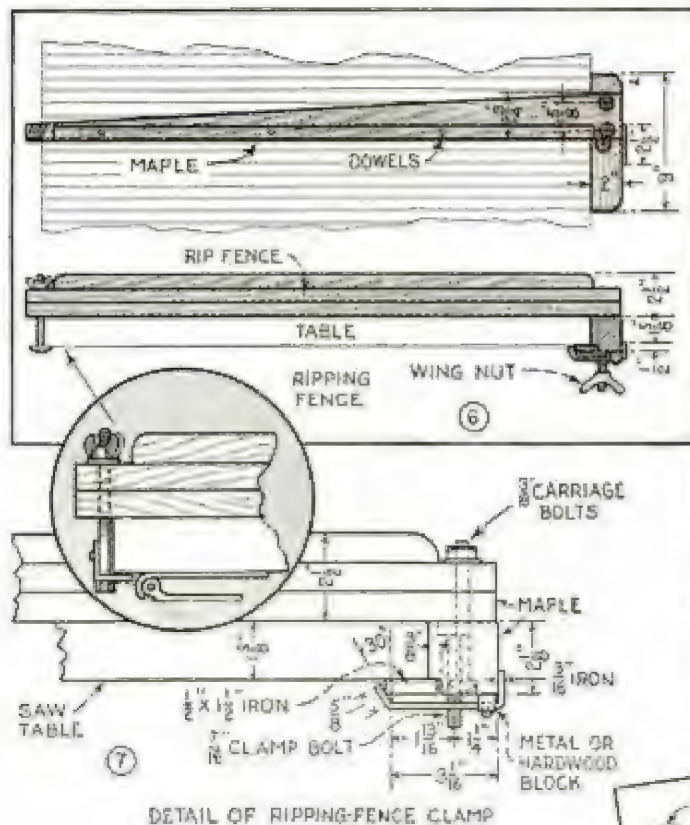


lugs or other projections and then make a shelf for the motor out of hardwood as in Fig. 5. Notice that the motor shelf is recessed for the ends of the castings and a gasket provides the necessary flexibility between the parts when they are bolted together. A sawdust chute is made of sheet metal and fitted in the opening of the upper casting, Fig. 4. As you will see from Fig. 5, the motor bolts pass through a sheet-iron plate

Holes in the separator base casting provide an easy means of bolting on a simple structure to support the hinged top and the saw mandrel. Figs. 2 and 5 show how the three bars of iron are bolted to the base. These bars can be either flat iron or channels of the same sectional dimension. A hardwood crosspiece is bolted to the projecting ends of the bars as in Fig. 2,

the thickness depending on the type of mandrel you use. For this reason, it's a good idea to decide this before you bolt the crosspiece permanently in place.

Now, before you get any further, the table should be built. There are several ways of building a table of this type. For example, you can use $1\frac{3}{16}$ -in. hardwood flooring, planing off the tongue and groove on each piece, and gluing the pieces together with the edges up. Another, and better, method is to rip an equal number of strips from maple and walnut, and glue them together alternately as in Fig. 3. There is an important point in getting out the stock. You can avoid the difficulty of cutting the groove for the crosscut guide by planing one of the $1\frac{3}{16}$ -in. strips back to a uniform thickness of exactly $\frac{3}{4}$ in. and ripping it $\frac{3}{8}$ in. narrower than the



others. When gluing up, this strip is inserted in the proper place. Due to the strains to which a wood saw table is subjected, it is best to bolt the strips together as in Fig. 3, using two $\frac{3}{8}$ -in. rods, each threaded at both ends, the nuts and washers being recessed in the edges of the table. Then both sides of the table are finished smooth, and waxed.

Three old auto door hinges are just the thing for hinging the table to the frame. If the hinges are loose from wear, you can usually tighten them by peening the ends of the pins. The hand screw that you see in Figs. 1 and 2 was made from a sewing-machine hand-wheel and a screw taken from an old piano stool. If you can't use the nut, you can easily make one by coating the screw with graphite and then pouring babbitt around it in a suitable form. A bracket, bolted to the frame, supports the hand screw, which should have at least a $4\frac{1}{4}$ -in. vertical movement. When level, the top of the table should be approximately $2\frac{1}{2}$ in. above the center of the mandrel. To get this distance it probably will be necessary to recess the bottom of the table for the mandrel bearings.

With this much done, you can mount the motor, belt it to the mandrel, then, with

the blade in place, start the motor and lower the table carefully onto the revolving blade, letting the latter cut its own slot. If you use a dado head, do the same thing to widen the slot. The ripping fence and the blade guard, Figs. 6, 7 and 8, finish up the job. The fence, Figs. 6 and 7, is made of hardwood, the arrangement for locking at both ends being shown in the details. The guard, of course, is optional.

☐ A mixture of cement, fine sand and wood-fiber plaster, with the fiber sifted out, produces a lasting, almost glazed surface on stone and concrete and it is impervious to moisture; it is ideal for pointing jobs and for finishing basement floors.

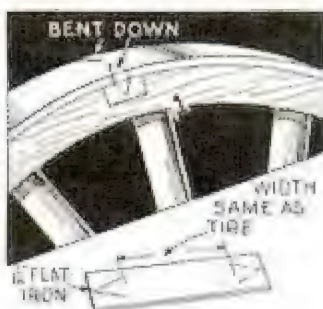
Detachable Screw-Gauge Handle Fits Entire Set



Merely removing a lock pin permits this handle to be switched from one screw gauge to another

When making up a set of heavy screw gauges, the detachable handle shown was used which not only saved time and material, but it also saved a great deal of weight and enabled a small box to be used for carrying the set. The handle was knurled on the outside as usual with a plain part at one end, after which it was drilled and reamed at an angle, and then used as a jig to drill each of the gauges, which were counterbored to receive it. A lock pin to fit this hole was made with one end knurled and a short portion in the center turned down so that a stop pin driven in the handle would hold it in place. To remove the handle, just push out the lock pin.—H. Moore, Hamilton, Ont., Can.

Tightening Loose Wagon Tires



The strips are an inch or so longer than the width of the tire, and V-notches are

Instead of wiring the tires of his farm wagon when dry weather causes them to loosen, one farmer uses strips of flat iron as shown, which makes a neat, lasting job.

cut near each end. When the strips are slipped under the tire, the V-shaped tabs are bent over it and the ends of the strip are bent down over the felly of the wheel.

Four-in-One Rubber Stamp Saves Time

In offices where three or four stamps are often used on one paper, much time can be saved by assembling the related stamps in one unit as shown. This is done by removing the rubber type from the smaller ones and cementing it to the sides of the largest stamp. The small type is brought into use by simply tipping the stamp to one side, thus making it unnecessary to pick up a stamp for each operation.



Emergency Holder for Balls of a Bearing

When dismantling a ball bearing around a piece of machinery where there is no holder for the balls, just pull out a few

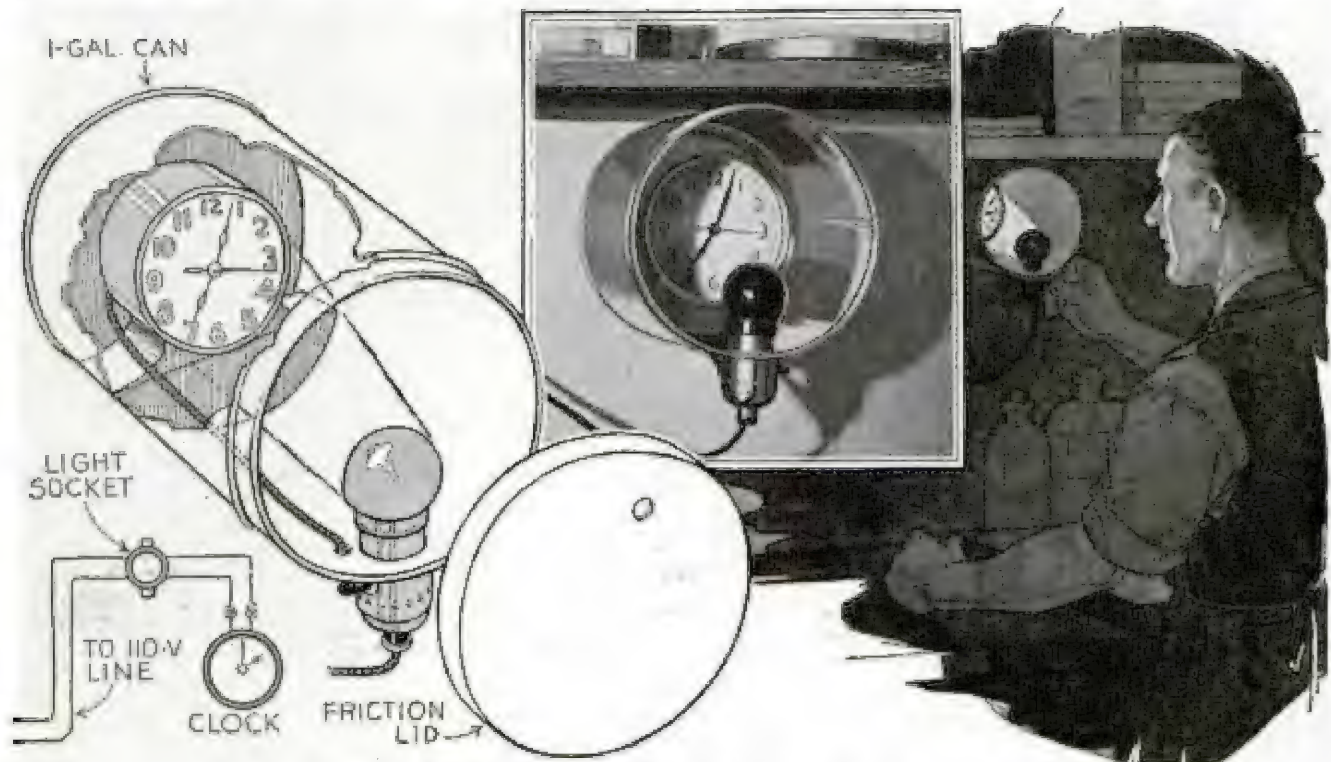


The curved inner surface of a flexible pocket rule makes a dandy holder for ball bearings

inches of a flexible pocket rule and you have a dandy one. The hooked end of the rule can be supported with a pocketknife and a wrench or other tool will prop up the other end as shown.

☛ A piece of inner tube, 2 in. square, makes an excellent squeegee, when folded, for spreading an even film of glue.

Darkroom Clock Is Seen Through Peep Hole



Made especially for use when handling panchromatic films, which must be developed in total darkness, this timing clock is viewed through a peep hole in its light-tight cover. Illuminated by a shielded, ruby lamp inside the cover, the clock is easily read at a glance. The parts required are a 1-gal. can with a friction lid, cheap electric clock with sweep second hand, push switch socket with extra wire hole, small red bulb, reflector for same, wire,

plug, and a bolt with nut and washers for mounting the clock under a convenient shelf. The socket is soldered into a hole cut in the box, the clock set in and connections made so that the light is independent from the clock, and may be turned off when not in use. The lid in which is drilled the $\frac{1}{2}$ -in. peep hole is left in place when handling films and plates, but it may be removed for printing and general timekeeping.

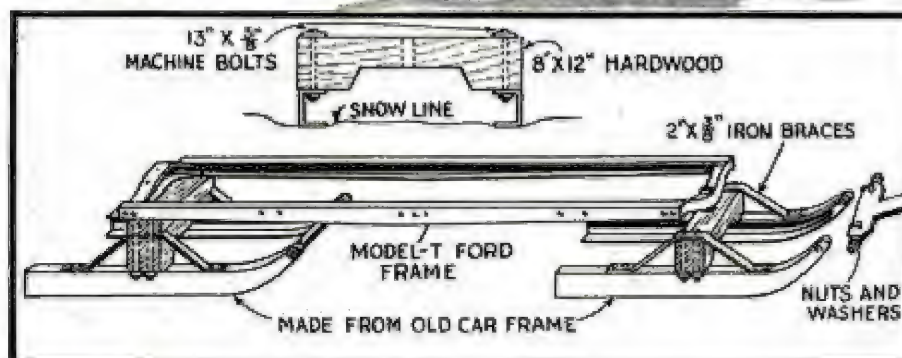
Iron Scrollwork Is Easily Bent on This Rigid Rotating Jig



Handling practically any bends necessary in making ornamental scrollwork, this inexpensive bending jig consists of two pipe flanges and a nipple. One flange is bolted to the bench and the nipple, which is slotted at the upper end, is screwed into it. The other flange is reamed to a snug, sliding fit over the nipple, and is drilled to take steel pins, which, in use, are set at various locations to form the desired bend when the flange is turned.

Indelible ink marks may be removed often by applying equal parts of turpentine and ammonia.

Sturdy Lightweight Bobsled Built of Automobile Frames



Ordinary hand tools are all you need to make this lightweight bobsled from two old car frames, one of which is cut in two to provide the four runners, the other one serving as a strong frame to tie the bobs together. A hardwood crosspiece braced with heavy flat iron ties the runners of each bob and provides rigid construction that will stand up under heavy loads.—Theodore A. Hodgdon, Whitingham, Vt.

Separating Milk in Cold Weather

Farmers and dairymen who experience difficulty in getting the usual amount of cream from their milk in cold weather, will find that the trouble is often caused by a tendency of the cream to stick to the metal disks in the separator. To avoid such trouble, run a half-gallon or so of warm water through the separator before turning on the milk.

—Frank Ward, Canyon, Tex.

Artist's Paint-Mixing Tray Held on Tumbler



By making up this simple paint tray to fit over a tumbler, an artist has both together so that the brush can be wetted and touched to the colors almost with one sweep of the

hand. The copper or tin tray is circular in shape, is $\frac{5}{8}$ in. deep and has several partitions. The wall of the opening in the center extends below the bottom to form a flange, which fits inside the tumbler to keep the tray from slipping. The entire job can be done with a pair of tinner's shears and a soldering iron.

Bolts of Dry Goods Easily Handled on Rack

Screwed to the counter in a dry-goods store, this simple wood rack will save the clerk's time when dispensing cloth from bolts. When showing a customer cloth, the bolt is simply laid in the rack where it is quickly unrolled by the clerk for the customer's inspection. Large wood screws, driven into the wood plugs in the ends of the bolt of cloth, serve as an axle to support it in the rack.

—Opie Read, Jr., Chicago.



Customers quickly inspect cloth in this rack, which permits the bolt to rotate freely

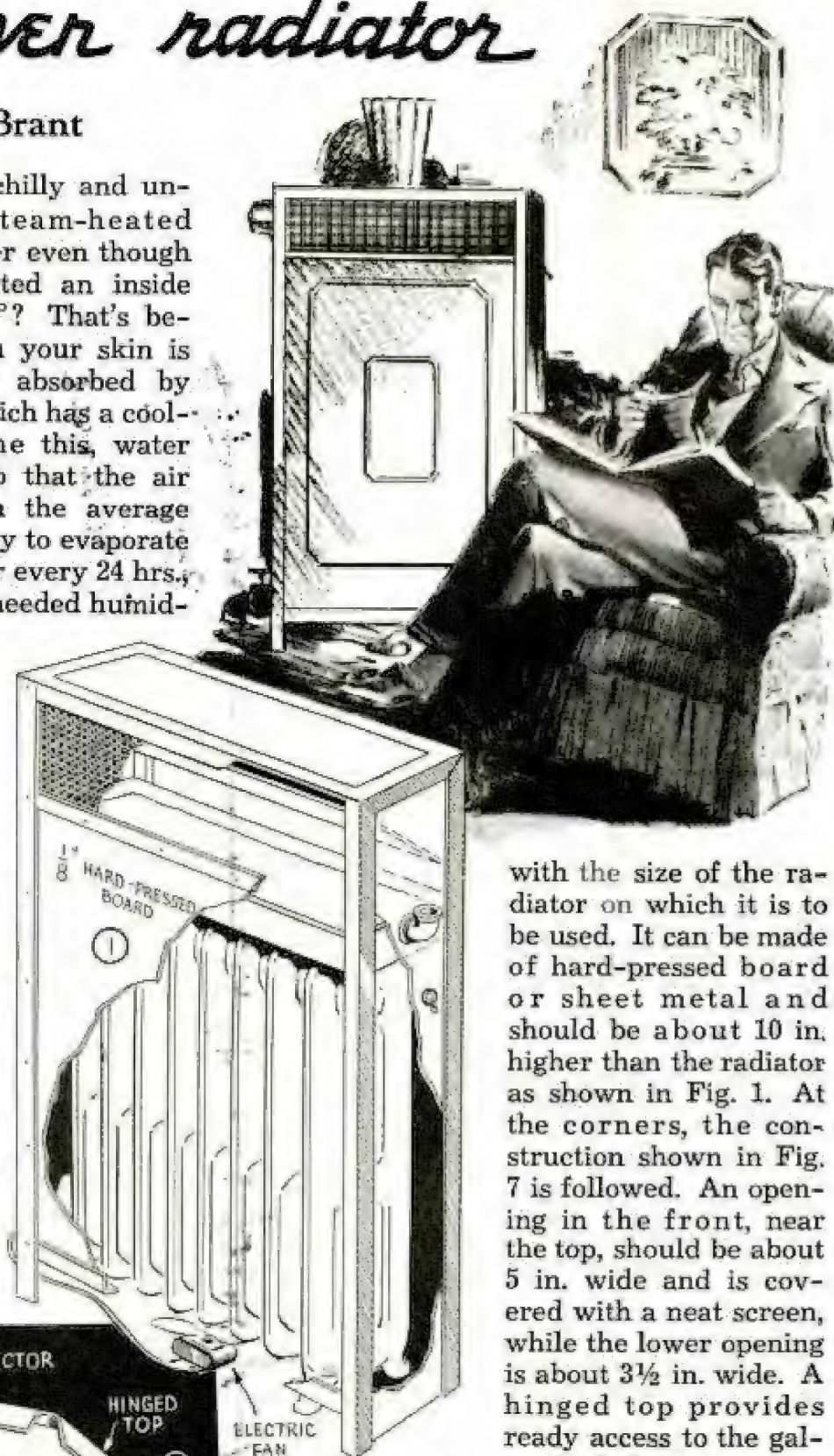
CABINET HUMIDIFIER

fits over radiator

By H. G. LaBrant

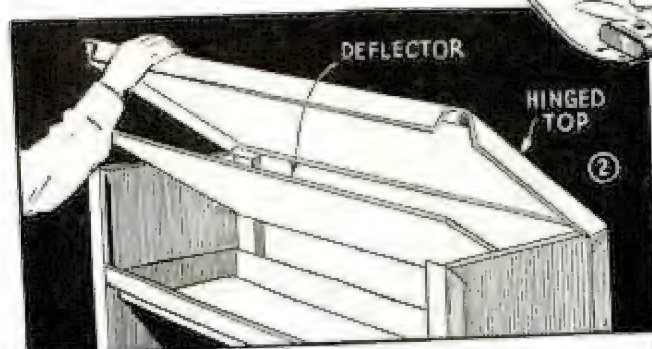
HAVE you ever felt chilly and uncomfortable in a steam-heated room during cold weather even though the thermometer indicated an inside temperature of 68 to 70°? That's because the moisture from your skin is rapidly evaporated and absorbed by the extremely dry air, which has a cooling effect. To overcome this, water should be evaporated so that the air will be kept humid. In the average small home, it is necessary to evaporate from 10 to 20 gal. of water every 24 hrs. in order to maintain the needed humidity, while individual rooms require only a few gallons. If you have a steam-heating system, the cabinet humidifier and circulator shown here will do the work. One unit takes care of a large room or two smaller ones.

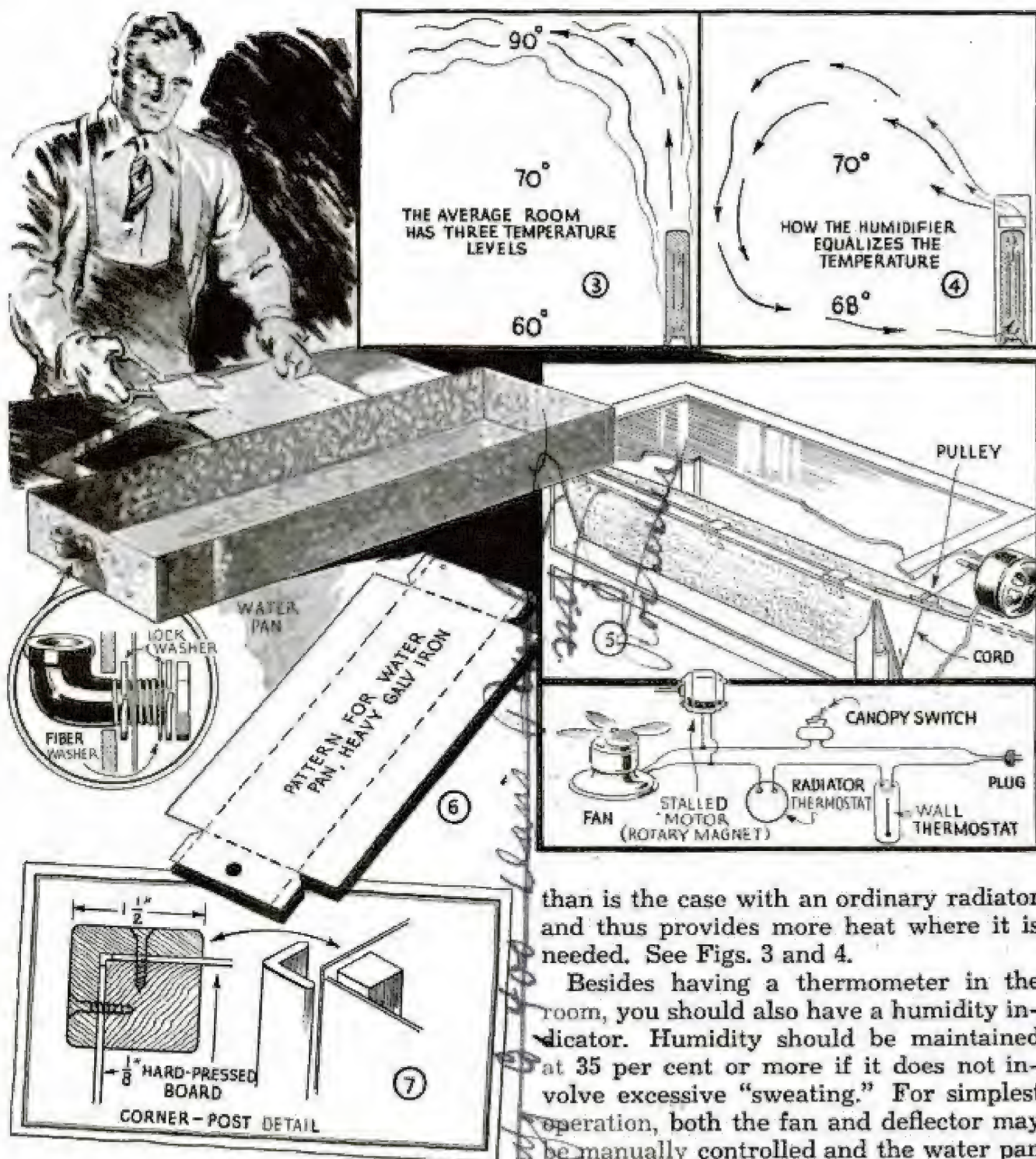
The unit consists of a cabinet, which houses a water pan over the radiator, has a deflector to control the amount of air contacting the surface of the water, and an electric fan to accelerate the air movement. Dimensions of the cabinet will vary, of course,



with the size of the radiator on which it is to be used. It can be made of hard-pressed board or sheet metal and should be about 10 in. higher than the radiator as shown in Fig. 1. At the corners, the construction shown in Fig. 7 is followed. An opening in the front, near the top, should be about 5 in. wide and is covered with a neat screen, while the lower opening is about 3½ in. wide. A hinged top provides ready access to the galvanized sheet-iron water pan, although, if desired, the pan may

be fitted with a street elbow extending outside of the cabinet to permit filling. Details on bending the water pan to shape are given in Fig. 6. The pan, which rests





on crosspieces of the cabinet frame, should have the largest possible evaporating area and therefore it should extend the full length of the radiator, but should have a 2-in. clearance between front and back of the cabinet to permit free circulation. One should keep in mind that evaporation of water increases with its temperature, area exposed to air and the velocity of air passing over the water. A small 6 or 8-in. fan placed under the radiator to direct air upward, can be switched on to warm up the room quickly. The deflector directs the warm air into a room at a much lower level

than is the case with an ordinary radiator and thus provides more heat where it is needed. See Figs. 3 and 4.

Besides having a thermometer in the room, you should also have a humidity indicator. Humidity should be maintained at 35 per cent or more if it does not involve excessive "sweating." For simplest operation, both the fan and deflector may be manually controlled and the water pan filled each day. To make the device automatic in operation, the fan circuit may be connected to a wall thermostat and, if desired, the deflector can be made to open at the same time that the fan starts by means of a shaded-pole induction motor, which winds up a cord attached to the deflector as in Fig. 5. When the deflector is up and the cord wound tight, this motor will stall. (Stalling will not injure a shaded-pole motor.) When the wall thermostat cuts off the current, the fan will stop and the weight of the deflector will cause it to close again. A wiring diagram is shown directly below Fig. 5.

Russell Electric Co.
370 W. 1st St.
Chicago, Ill.

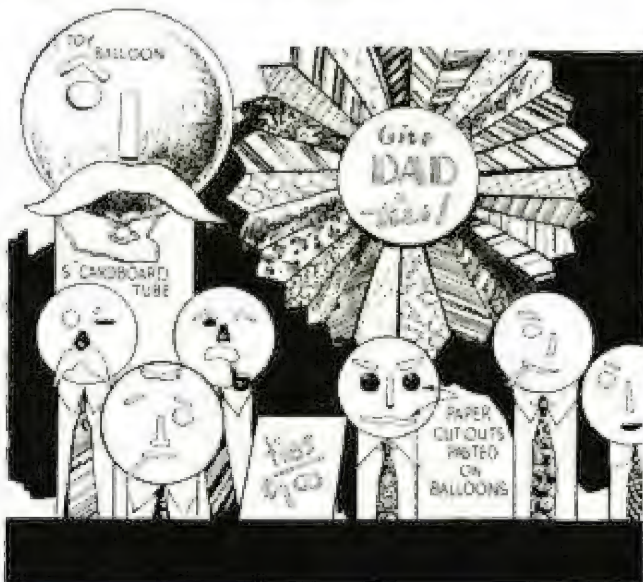
Air-Cleaning Cutting Tools

It is recommended that cutting tools such as taps, dies, drills, etc., be cleaned with air instead of knocking them against some solid object to jar off metal chips and filings. With this method, there is no danger of bending or checking the tools. Compressed air is ideal where available, but a small syringe or similar rubber bulb with a nozzle can be used.

—A. H. Waychoff, Tempe, Ariz.

Balloon "Manikins" Model Ties in Store Window

Simple and effective, this display for neckties is made by fitting toy rubber balloons with paper cutouts to represent features and mounting them on cardboard-tube standards. The balloons should be blown up to about 10 in. in diameter and tied. From a piece of white paper, make the cutouts to form the eyes, nose and mouth, and use rubber cement to fasten them in place. Roll sheets of cardboard into tubes about 5 in. in diameter and 2 ft. long and cover them with tissue paper. Place the balloons on top of the cardboard tubes and fit the figures with collars and ties.—F. M. Mix, Chicago.



These grotesque balloon "faces" are sure to attract the attention of passing shoppers

Printer Uses Small Sandbags for Paperweights

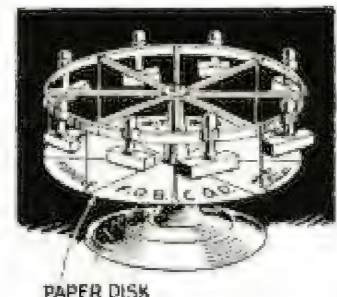


If a number of small sacks are filled with sand, they make paperweights which are easy to handle

Filled with coarse sand, cloth tobacco sacks were found handy for paperweights by one printer for weighting stacks of paper stock and printed matter when the windows were opened for ventilation on windy days. The sacks are tied securely at the top, small rings being fastened to the ends of the tie strings so that the weights can be suspended from nails when they are not being used.

Rubber Stamps on Rotary Holder Identified by Paper Dial

For quick selection of any stamp on a rotating holder, a clerk glued a paper disk to the latter and printed the facsimile of each stamp on the paper. The lettering on the disk should be large enough to be read easily at a glance.



PAPER DISK

❑ A cheap vacuum-filler type fountain pen is a convenient oil container for carrying in the pocket.

Technical Service
Bureau 6805 N. Clark, Chicago

Nichrome wire
Pure nichel wire

Electric Temperature

HOW TO MAKE THERMOCOUPLE PYROMETERS
TEMPERATURES OF MOLTEN METALS, ETC., AS

THERMOCOUPLE

by C.A. Crowley



of all necessary to decide upon the type of metals which should be used in the couple itself. Fig. 2 shows the maximum working temperature which can be used with seven different types of thermocouples. The first type of couple shown in Fig. 2, Chromel-Alumel, can be used for measuring temperatures as high as 2,500° F. It is impractical to build thermocouples

MILLIVOLTS CORRESPONDING TO TEMPERATURES

(2)

TEMPERATURE	CHROMEL-ALUMEL	NICHROME IV-NICKEL	NICHROME-NICKEL	NICHROME-ADVANCE	NICHROME IV-ADVANCE	IRON-ADVANCE	COPPER-ADVANCE
2500° F.	54.85						
2400°	52.95						
2300°	51.00						
2200°	49.01						
2100°	46.97	48.72					
2000°	44.89	46.40					
1900°	42.77	44.08					
1800°	40.62	41.76	29.52				
1700°	38.43	39.44	27.88				
1600°	36.20	37.12	26.24	54.40	65.44	47.52	
1500°	33.94	34.80	24.60	51.00	61.35	44.55	
1400°	31.65	32.48	22.96	47.60	57.26	41.58	
1300°	29.33	30.16	21.32	44.20	53.17	38.61	
1200°	26.98	27.84	19.68	40.80	49.08	35.64	
1100°	24.62	25.52	18.04	37.40	44.99	32.67	
1000°	22.25	23.20	16.40	34.00	40.90	29.70	
900°	19.88	20.88	14.76	30.60	36.81	26.73	
800°	17.52	18.56	13.12	27.20	32.72	23.76	
700°	15.18	16.24	11.48	23.80	28.63	20.79	
600°	12.85	13.92	9.84	20.40	24.54	17.82	13.38
500°	10.56	11.60	8.20	17.00	20.45	14.85	11.15
400°	8.31	9.28	6.56	13.60	16.36	11.88	8.92
300°	6.09	6.96	4.92	10.20	12.27	8.91	6.69
200°	3.87	4.64	3.28	6.80	8.18	5.94	4.46
100°	1.52	2.32	1.64	3.40	4.09	2.97	2.23
TO METER -	0-60	0-50	0-30	0-60	0-70	0-50	0-15

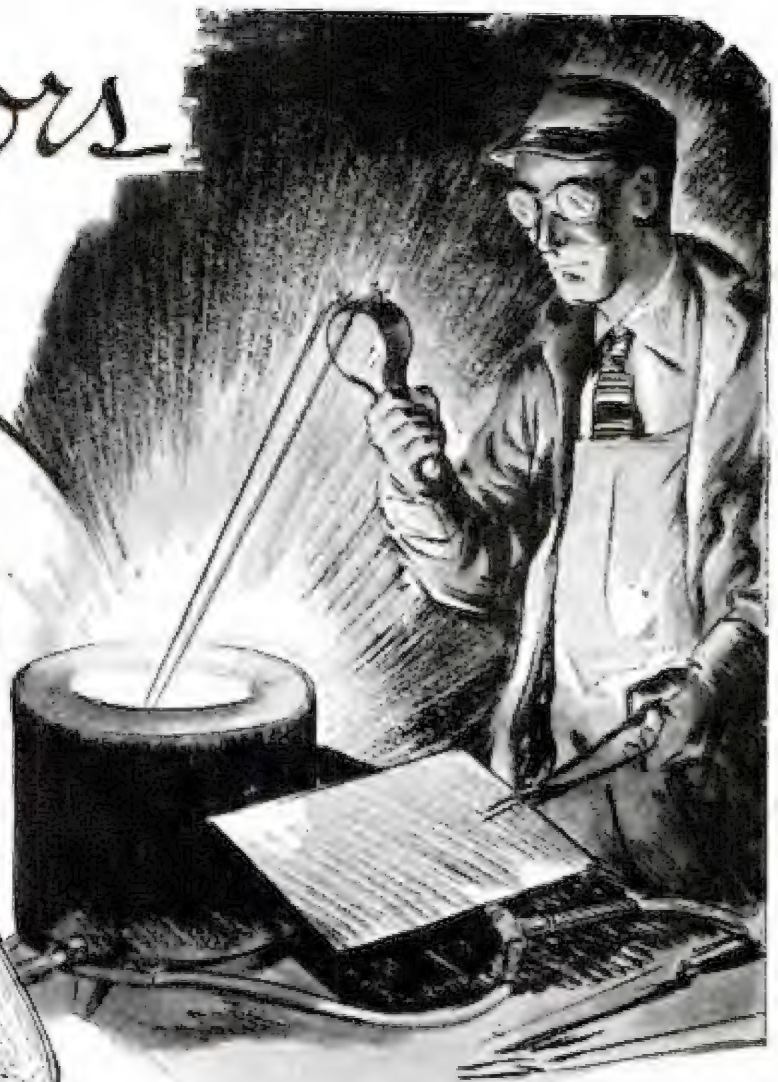
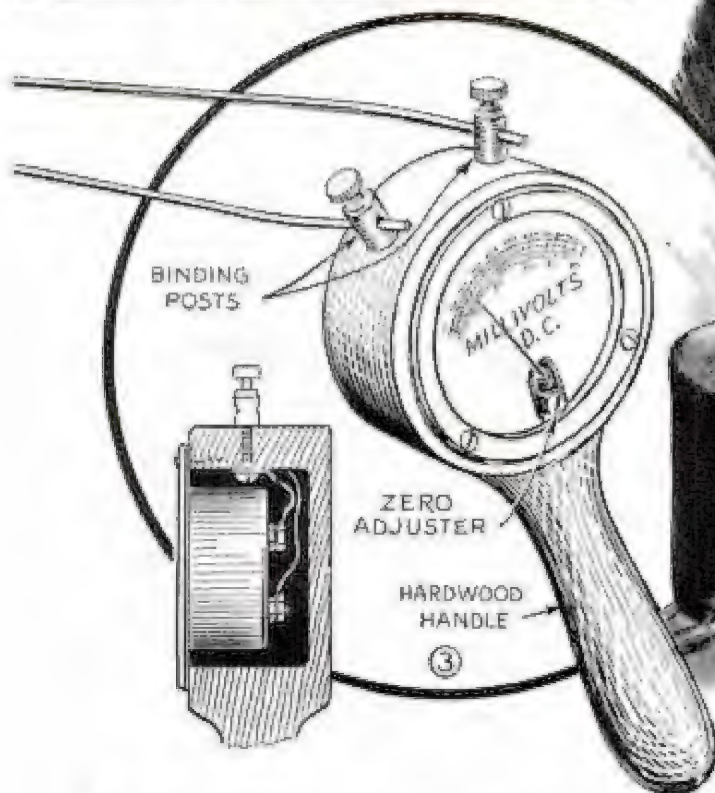
TWO pieces of wire of different metals or alloys, welded or brazed together at one end, and connected to a d.c. millivoltmeter at the other end form a thermocouple pyrometer. The welded end is inserted where temperature is to be measured. Heat at this end causes a difference in electric potential which is shown on the millivoltmeter, the scale of the instrument having been calibrated in degrees. The millivoltmeter is simply a voltmeter which is sufficiently sensitive to read as low as .001 of a volt, or less in certain cases. These are available from instrument manufacturers and, unless the pyrometer is to be used for extremely accurate work, the inexpensive kind will serve the purpose admirably.

In designing a thermocouple, it is first

Weston Electrical Instrument Corp.

Indicators

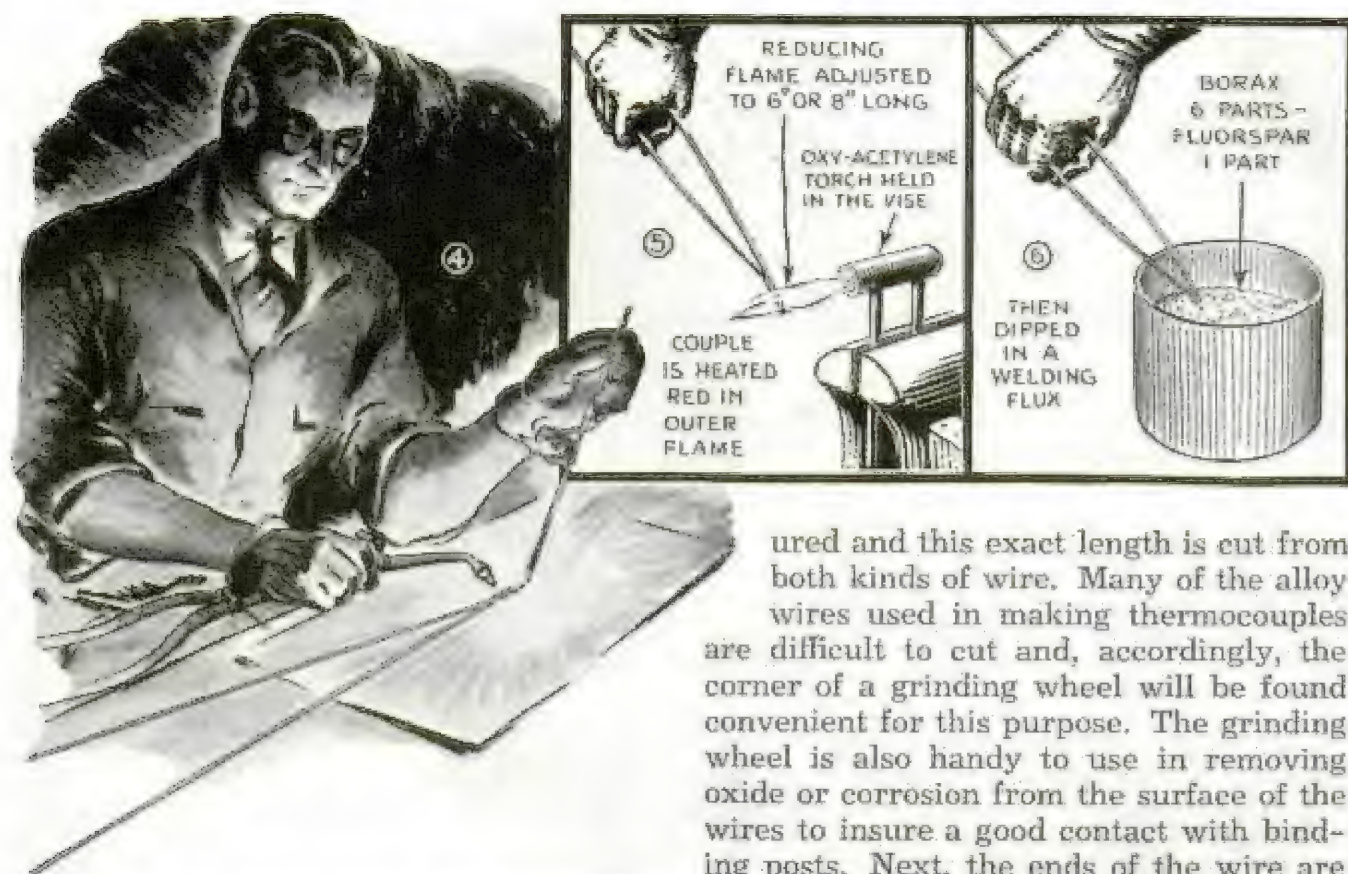
FOR MEASURING
HIGH AS 2500° F.



for measuring temperatures higher than 2,500° F. because all thermocouple metals, with the exception of platinum and extremely expensive alloys, melt or cease to be sensitive at about this temperature. If it is not necessary to measure temperatures this high, one of the other couples shown in Fig. 2 may be selected for the job. A couple made from Nichrome IV and Advance wires, is the most sensitive of all of the couples described. Thermocouples made from these metals may be used up to 1,600° F.

After deciding which metals will serve the purpose at hand, it will be necessary next to decide upon the form of couple and pyrometer which are to be constructed. If the couple is to be used for measuring the temperature of molten metals in a crucible, the design shown in Fig. 3 is extremely practical. This type of pyrometer consists of a millivoltmeter mounted in a handle turned from wood. The ends of the thermocouple wires are attached to the

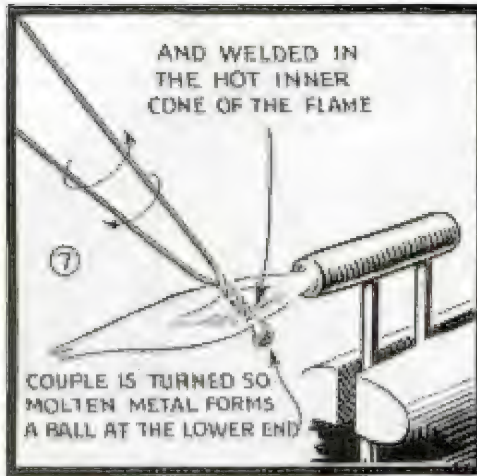
binding posts of the millivoltmeter as shown. If rigid No. 8 or 10-ga. wire is used, this arrangement is quite handy around the shop. If the thermocouple required must be permanently installed for indicating the temperature inside a furnace or other inaccessible place, a unit such as shown in Figs. 8 and 9 is more satisfactory. With this type of installation, the millivoltmeter is mounted on the wall as in Fig. 8, at a suitable location where it can be read easily and the wires run to the thermocouple which is permanently installed in the furnace or other equipment as in Fig. 9. If you wish a rugged portable pyrometer, Fig. 10 shows the most convenient method of construction. In this case, a section of steel tubing is welded closed at one end and the thermocouple junction inserted and sealed in place. The lead wires from the couple to the instrument should be well insulated and may be made as long as required, provided a sufficiently large size of wire is used. To



use this type of pyrometer, the instrument is set at any convenient location and the thermocouple tube inserted into the furnace or other location at which it is desired to read the temperature. This type of pyrometer is particularly desirable when the unit is to be used for metallurgical work. Many metals and alloys when in contact with thermocouples, will alloy with them and therefore change the instrument reading.

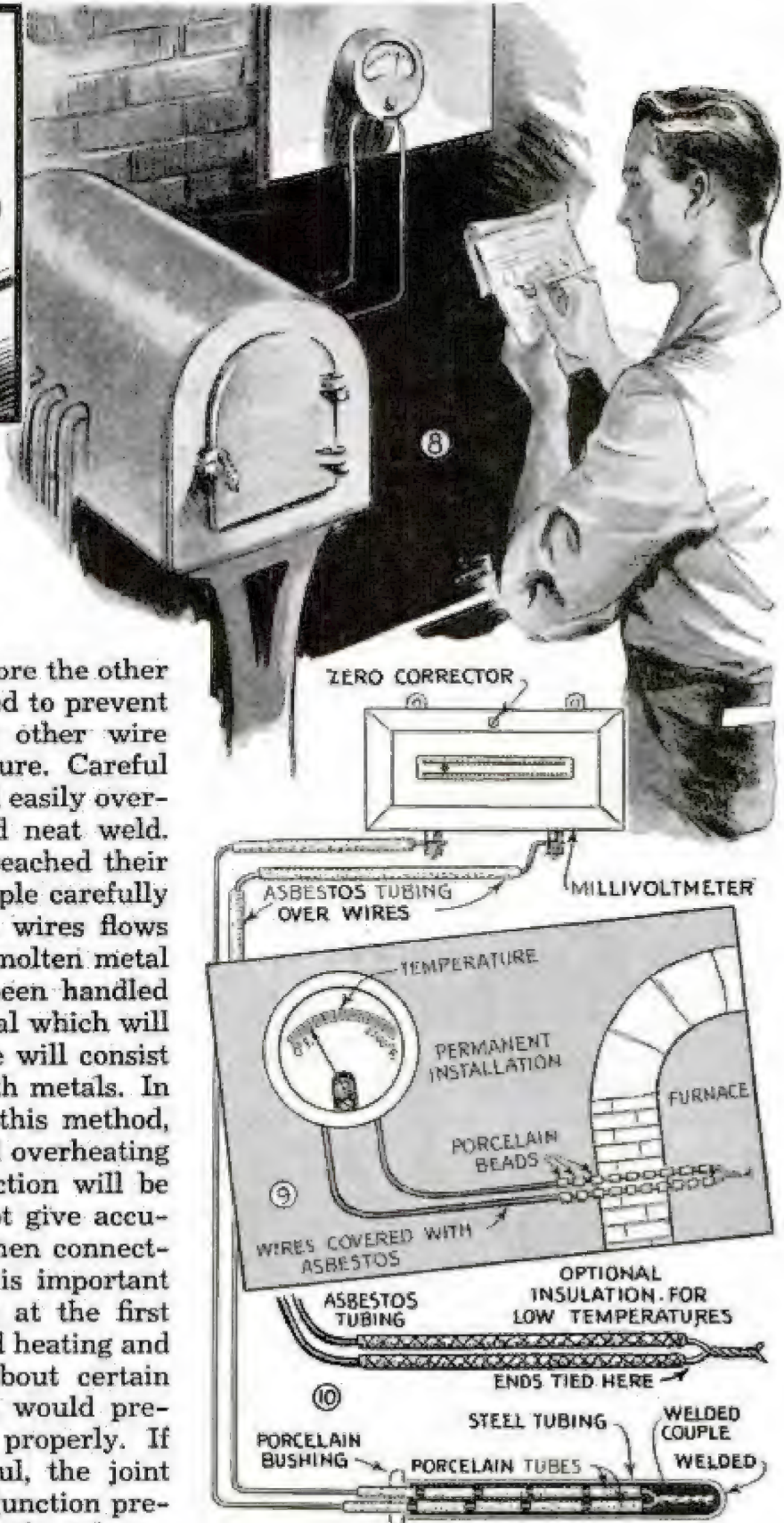
After selecting the particular thermocouple metals, which will operate at the maximum temperature which the unit is to be used on, from Fig. 2, and after you have decided upon the form of unit which will be the most serviceable for your purposes, the next step is to procure the material needed and start construction. In the case of all of the instruments, it is desirable to use as large a wire size as possible for the construction of the couple in order to prevent losses and to make the instrument as accurate as possible. Thermocouples which are to be operated at high temperatures particularly, should be constructed of at least No. 10-ga. wire. For intermittent use and when short leads are used, No. 12, 14 or even 18-ga. wire may be selected. The exact length of thermocouple wire required to reach from the couple location to the instrument is meas-

ured and this exact length is cut from both kinds of wire. Many of the alloy wires used in making thermocouples are difficult to cut and, accordingly, the corner of a grinding wheel will be found convenient for this purpose. The grinding wheel is also handy to use in removing oxide or corrosion from the surface of the wires to insure a good contact with binding posts. Next, the ends of the wire are fastened side by side in the jaws of a vise as shown in Fig. 1. The ends of the wires should protrude above the vise jaws about an inch. They are then twisted together as shown, with a pair of pliers. The twists should be made regular and firm to insure good contact. If the thermocouple is to be operated at a temperature below the melting point of silver solder or brazing spelter, the junction may be brazed neatly by heating it in the torch, Fig. 4, sprinkling with borax and applying just enough silver solder or brazing spelter to flow into the junction and insure good contact. For high-temperature work where brazing would not be satisfactory, an oxyacetylene torch should be used to weld the ends of the wires together. In making thermocouple welds, it is convenient to hold the torch in the vise so that the flame will be horizontal, as in Fig. 5. The gas valves are then adjusted to produce a slightly reducing flame about 6 or 8 in. long and so that the inner cone is between $1\frac{1}{4}$ and $1\frac{1}{2}$ in. long. A reducing flame is produced when a slight excess of acetylene is being fed to the flame. Now, the twisted junction is held in the flame until both wires become red hot. The junction is then withdrawn and dipped into a good welding flux as in Fig. 6. The flux will stick to the wire due to its being melted by the heat.

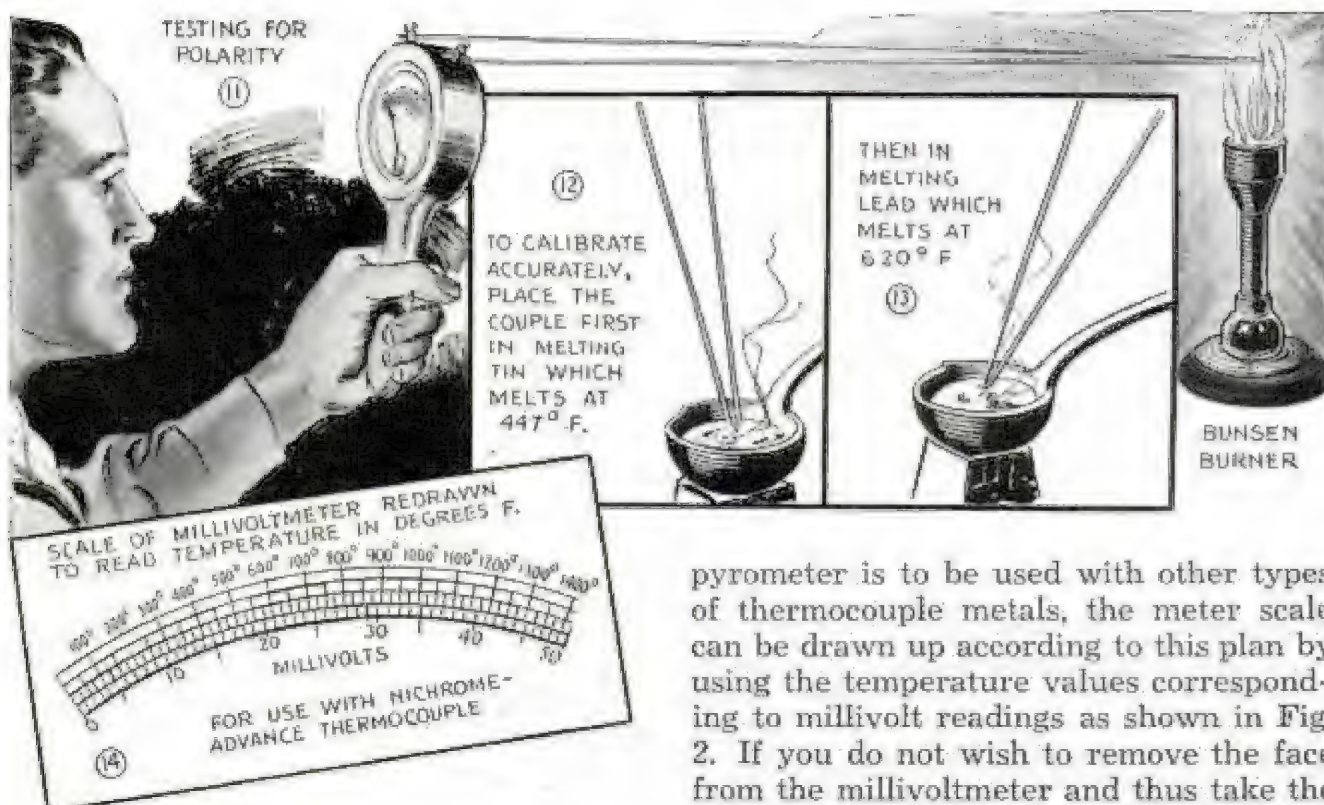


The wire junction is now returned to the hottest part of the flame and kept moving to insure even heating as in Fig. 7. In all cases, one of the wires making up the junction will tend to melt before the other and some care will be required to prevent it from flowing before the other wire comes to its melting temperature. Careful manipulation in the flame will easily overcome this and insure a good neat weld. When both wires have just reached their melting points, rotate the couple carefully so that the metal from both wires flows together and forms a ball of molten metal at the tip. If the job has been handled satisfactorily, this ball of metal which will flow to the end of the couple will consist of an intimate mixture of both metals. In welding a thermocouple by this method, care should be taken to avoid overheating and burning. A burned junction will be weak and in addition will not give accurate temperature readings when connected to the millivoltmeter. It is important that the weld be completed at the first attempt, inasmuch as repeated heating and cooling is likely to bring about certain changes in the alloys which would prevent them from functioning properly. If the first weld is unsuccessful, the joint should be cut off and a new junction prepared. After a little practice, the job can be handled quite easily.

Having completed the junction, the other ends of the thermocouple wires are filed or ground clean and bright to insure good contact and connected to the terminals of the millivoltmeter. To test the instrument for polarity, and also to check the effectiveness of the weld, the thermocouple



may be placed in the flame of a burner while watching the voltmeter needle as in Fig. 11. If the needle tends to move in the wrong direction, this indicates that the couple was connected wrong and then, the connections to the instrument should be reversed at the meter terminals. If heating in the flame produces a regular de-



flection of the millivoltmeter, you are ready to assemble the pyrometer according to the plan which has been decided upon. If the unit is to be built according to the plan shown in Fig. 3 the wires will need to be bent carefully to the proper shape so that the ends can be fastened tightly in the binding posts of the millivoltmeter. After this, the wires may be formed so that they are of convenient shape for inserting into the furnace while holding the handle of the instrument in such a position as to facilitate reading. If the unit is being built along the lines indicated in Figs. 9 and 10, porcelain beads or glass beads, if the temperature to which the pyrometer is to be exposed is not high enough to melt them, should be slipped over the wires as shown to prevent their coming in contact with each other and with the metal case. If bare thermocouple wire is used, it may be insulated by slipping sections of asbestos tubing over the entire length of each wire. A convenient plan which produces a neat job is to place asbestos tubing over the wires and to encase the two jointly in a length of rubber tubing. This will effectively prevent contact between the wires.

Fig. 14 shows a millivoltmeter scale to which has been added figures giving corresponding temperatures for use with a Nichrome Advance thermocouple. If the

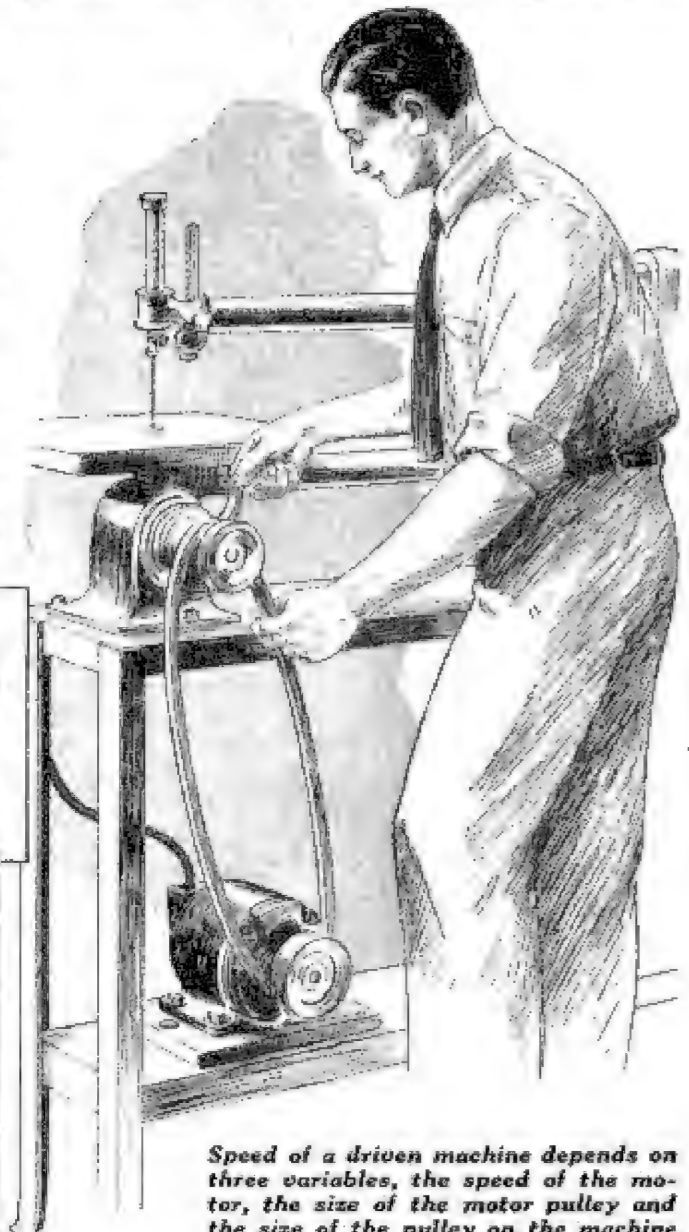
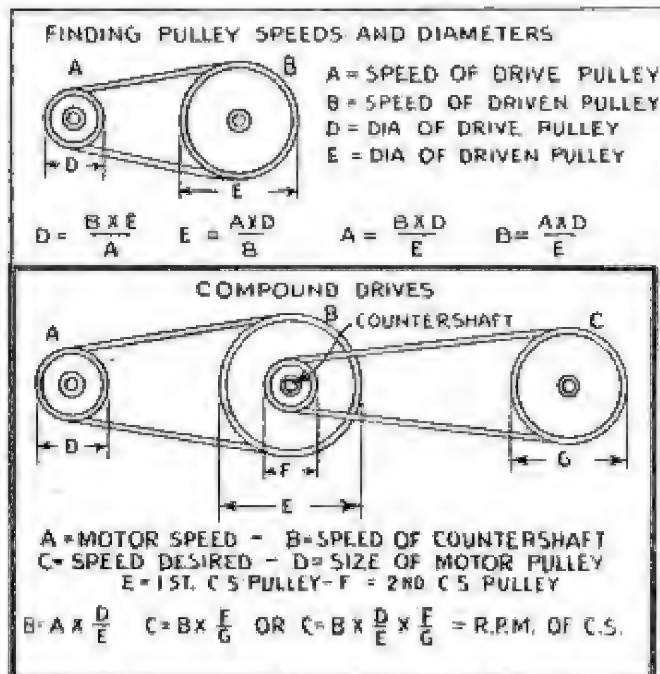
pyrometer is to be used with other types of thermocouple metals, the meter scale can be drawn up according to this plan by using the temperature values corresponding to millivolt readings as shown in Fig. 2. If you do not wish to remove the face from the millivoltmeter and thus take the chance of impairing its accuracy, it is quite satisfactory simply to prepare a chart which gives temperatures corresponding to millivolt readings. A chart of this type can be placed on the wall near the pyrometer for instant reference.

To use the pyrometer thus altered, adjust the zero adjuster on the millivoltmeter until the needle points to the millivolt reading corresponding to room temperature. This should be done with the couple out of the heat. Upon inserting the couple into the furnace the needle will then read correctly. For more accurate work the couple should be calibrated by placing it in melting tin and then in melting lead, Figs. 12 and 13. As the metals are heated the millivolt reading will rise gradually until the melting point is reached, then the reading will hold constant for a few seconds. The reading at which the temperature holds constant is the melting point. To check this value let the hot molten metal cool while watching the millivoltmeter. Here again the needle will hold at the melting point.

¶ When mixing paints, an accurate method of assuring that each batch will be identical in color, is to put a sample of each one on a clean paddle and let them run together by inclining the paddle. If a blend is noticeable when the two samples mix, the colors are not identical.

Getting Pulley Sizes Right for Correct Speeds

As most workshop machines should be run within limits of certain definite speeds to make them most efficient for use, often varying with the particular stock used and with the job, the problem becomes one of selecting the right size pulleys. Speed of a driven machine depends on three variables, namely, the speed of the motor, the size of the motor pulley and the size of the pulley on the machine to be driven. As the speed of motors used for this type of work is generally about 1,750 r.p.m., speed regulation depends mostly on the pulley sizes. Increasing the diameter of the drive pulley increases the speed, and



Speed of a driven machine depends on three variables, the speed of the motor, the size of the motor pulley and the size of the pulley on the machine to be driven

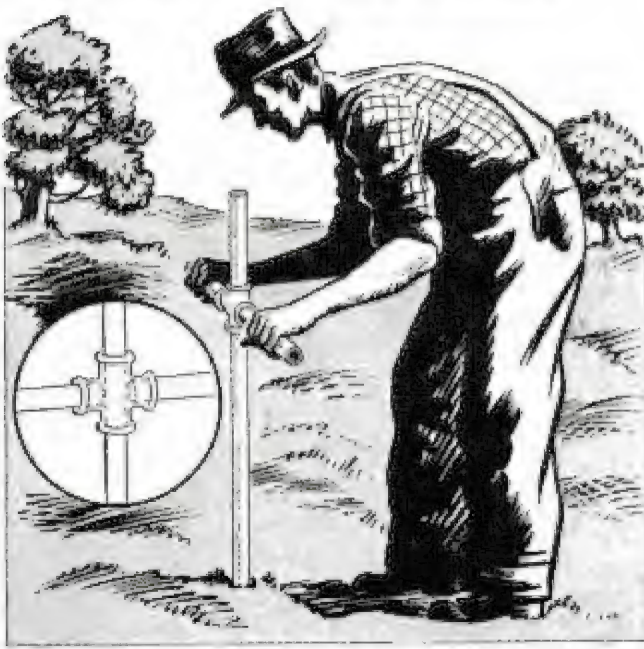
increasing the diameter of the driven pulley decreases the speed of the machine. The use of V-pulleys is advised and these can be obtained in sizes varying from 1½ to 12 in., the sizes increasing by ¼ in. on the smaller pulleys and by 1 in. on the larger pulleys. The formulas given here will enable you to figure out your requirements quickly. Should the increase or decrease in speed be so great that too large or too small pulleys are required, a countershaft carrying a pair of pulleys or an assembly of cone pulleys is used. If this method is followed, do not fail to take into consideration that considerable power is used to operate this shaft. Therefore, a motor which is adequate to operate the machine directly may be overloaded. Rec-

ommended speeds for various machines are usually given in the manufacturer's instructions. If one machine has several recommended speeds, cone pulleys may be used on both motor and machine.

Avoiding Breakage of Band Saws

When band saws break after they have been in use a while, probably the trouble is caused by friction between them and the guide. This heats the blade and often tends to caseharden the edge, making the metal very brittle. Such breakage can be reduced by removing a small amount of the metal with a soft-grained emery stone held lightly against the back of the blade while it is running.

Long Rock Drill Operated Easily with Detachable Handle



This simple handle permits a rock drill to be twisted to remove it from a crevice

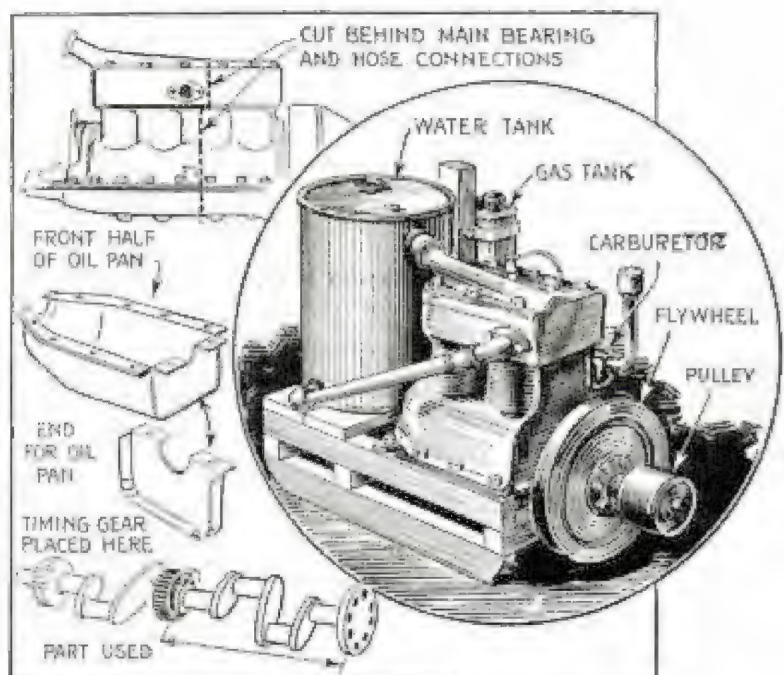
When a long drill is used to make holes in rocky ground for blasting, it may be operated more easily if a simple assembly of two pipe nipples and a 4-way fitting are used as a detachable handle. The nipples are screwed tightly against the drill. This arrangement permits the drill to be twisted and extracted easily when it becomes wedged in a crevice.

—G. E. Hendrickson, Argyle, Wis.

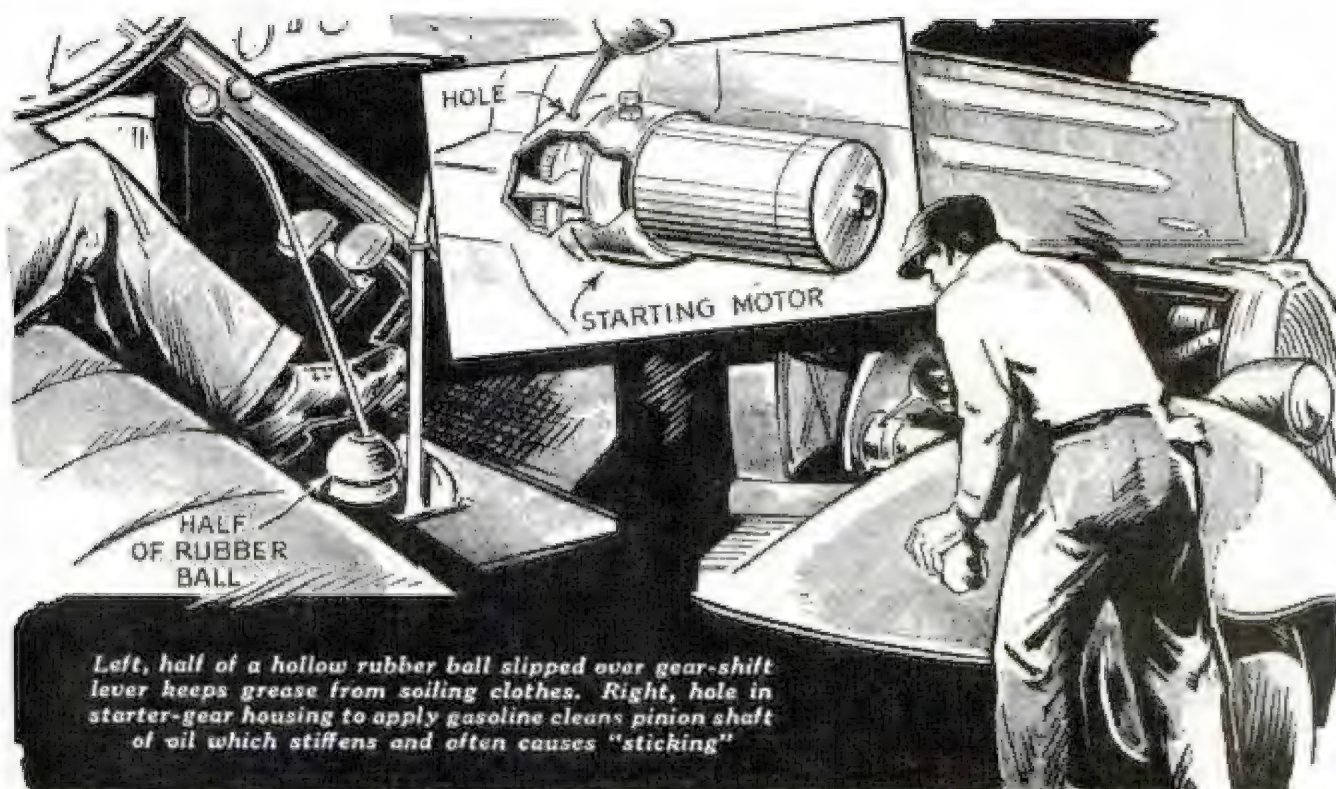
Single-Cylinder Engine from Car Motor

Anyone who needs a one-cylinder engine of the utility type can make one from an old auto motor at small cost. First dismantle the motor and cut the block in half with a hack saw as indicated in the upper left-hand detail, being sure to cut behind the center main bearing and the side hose connection. Then saw the head casting to match the block. Next, cut the oil pan, the front half being used, and, from a piece of sheet metal, cut out an end for the pan, leaving $\frac{3}{4}$ -in. flanges at the edges by means of which this piece is welded or soldered to the rest of the pan. Be sure to remove a piece

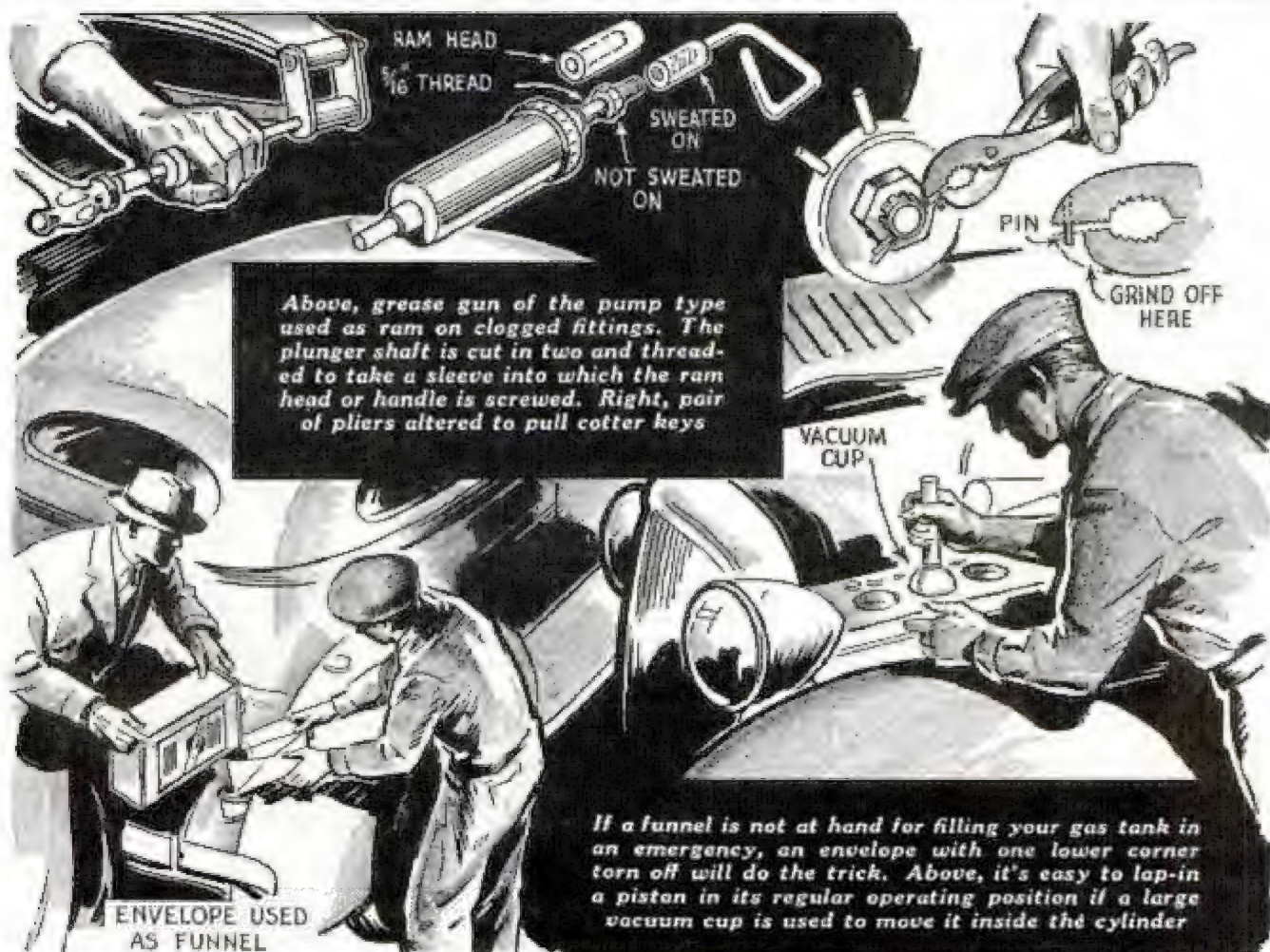
from the back of the pan so that it fits snugly over the rear main bearing. When assembling, use a felt strip to seal the opening. Plug up the water-jacket openings in the block and head where they have been cut. This can be done by either welding or soldering pieces of sheet metal over them. Then comes the cutting of the crankshaft, the rear half of which is used. By carefully studying the lower left-hand detail, you will see where this is done. Be sure to cut as far in front of the center main bearing as possible. On the end opposite the flywheel flange, the timing gear is mounted. Now, cut the timing gear shaft with a chisel, as it is too hard to saw. The front half of this is used and it is cut just behind the center main bearing. Assemble the front half of the engine, being sure that the timing gear is in the same position as it was before the motor was dismantled. Only the first cylinder is used, which means that only one connecting rod and one piston are needed. One half of the intake port and chamber is plugged with lead to prevent gas leakage into the idle cylinder. The carburetor is mounted directly against the intake port with two studs. One coil connected to a 6-volt battery and the proper place on the timer will work satisfactorily. The Ford flywheel is mounted in its regular place and a pulley may be attached with the same bolts that hold the flywheel.



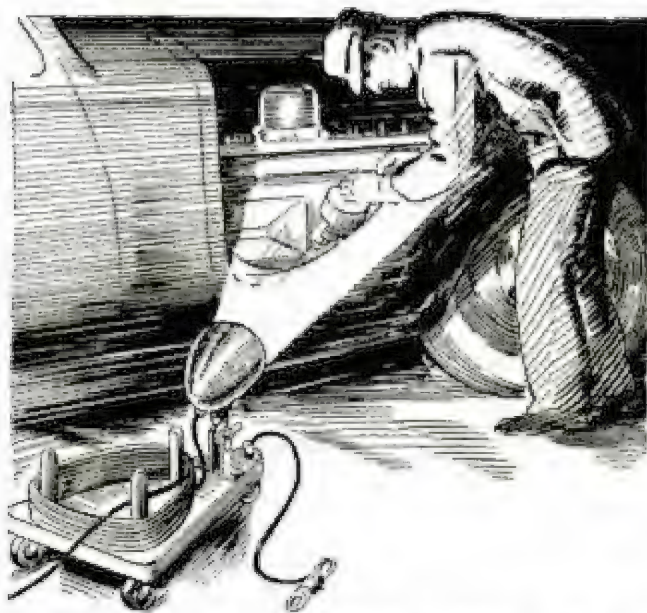
Economical to operate, this converted motor will do the work of the average small gas engine of 1 or 2 hp.



AUTO Short-Cuts



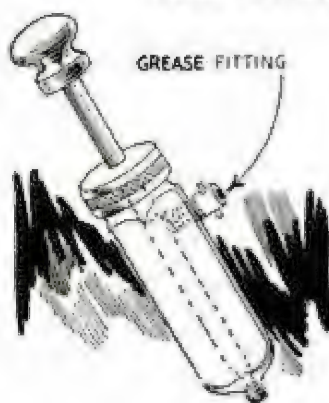
Portable Floodlight in Garage Illuminates Your Work



This floodlight is easily moved to any part of the garage to brightly illuminate work

The problem of getting plenty of light where it was most needed in a garage was solved by one mechanic who used a portable floodlight. It consists of an old auto headlight or spotlight which is mounted on a three-wheel dolly, using a long bolt and wing nut so that the lamp can be adjusted instantly to any angle. This idea is especially handy in small, rural garages where electricity is unavailable, as the dolly can be made large enough to accommodate a storage battery. If the light is used on a 110-volt line, however, it will be necessary to cut away part of the rear of the headlight so that a socket and 110-volt lamp can be installed. Hardwood dowels projecting from the dolly provide a reel for the extension cord.

Ram to Open "Frozen" Bearings Has Grease Fitting



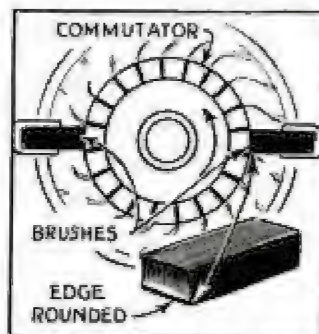
The job of filling a ram, used to open plugged bearings, is simplified if a grease fitting is installed as shown. The fitting permits the ram to be filled with a regular grease gun, in-

stead of taking it apart and forcing grease in with a paddle. The fitting should be located on the side so that it will be below the plunger when the latter is pulled back.

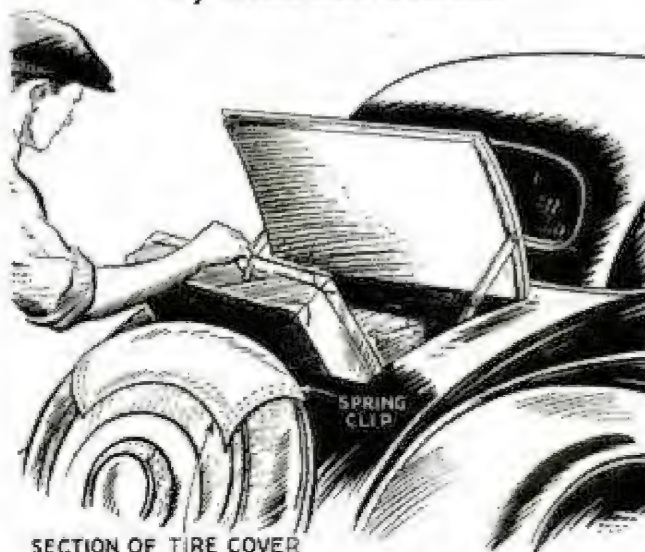
—R. Mooney, Erie, Pa.

Shaping Generator Brushes to Improve Operation

If the commutator of your car generator or starting motor gets dirty quickly, the trouble is sometimes due to carbon particles worn or chipped off the brushes. When replacing one or more of them, after sanding the contacting surfaces to the exact arc of the commutator, take a file and round off the sharp edge of each brush facing the direction of rotation of the commutator. This will eliminate any tendency of the commutator segments to chip off particles. The portions of the brush filed off should be as small as possible as good commutation depends greatly on a maximum contact between the brushes and segments.



Metal Tire Cover Protected by Rubber Shield



Shield clips over tire cover to protect it when removing heavy articles from the luggage compartment

On cars where the spare tire is carried directly behind the luggage compartment, a rubber or fabric shield clipped over the

metal cover will protect it against scratches when removing heavy suitcases, boxes, etc. The ends of the shield are folded over spring-brass or steel clips and cemented to hold the latter in place and to keep them from touching the tire cover.

Eliminating Brake Chatter



I find that brake chatter is sometimes caused by loose rivets in the lining, and can be eliminated in such cases by removing the brake shoes and resetting the rivets. After this has been done, of

course, the brakes should be readjusted carefully.—James W. Clift, Columbus, O.

Mirror Serves as Trouble Lamp

If you have motor trouble at night, and there's no flashlight at hand, remove your rear-view mirror and have someone hold it to reflect light from the head or cowl



If a flashlight isn't at hand for motor trouble at night, try using a mirror

lamps onto the motor. If you are alone, prop the mirror on a fender or some other part of the car so that it will catch the light from one of the cowl lamps.

¶To find a crack in a cylinder block, rub it with machine oil and dry; then rub the oiled surface with powdered chalk, and any cracks will become visible.

Rain Kept Out of Gasoline Tank by Shield on Pump Hose

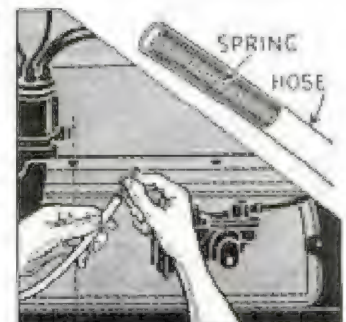


Water running down gas hose during rain deflected from car tank by rubber cap on nozzle

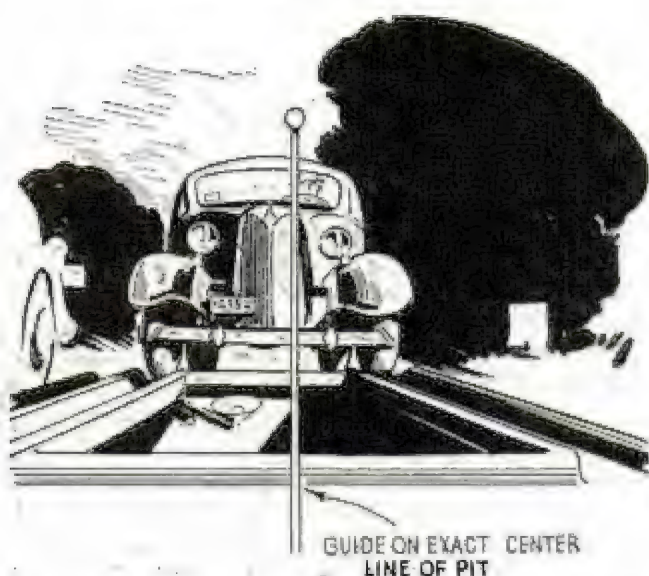
In order to keep water from running down the pump hose into gas tanks, when filling the latter during a rainstorm, one gasoline-station attendant put half of a hollow rubber ball over the hose nozzle so that it would cover the filler hole as shown. The opening in the ball is a tight, slip fit over the nozzle so that it can be removed easily when not needed.

Gas Line Prevented from Kinking with Small Coil Springs

Owners of the newer cars that have the motors mounted on rubber, often experience difficulty by having the flexible sections of the gas and oil lines where they connect to the motor, pinch together, causing sluggishness or perhaps total inoperation. This trouble can be avoided to a certain extent by removing the flexible sections and inserting coil springs inside at points where they have a tendency to kink. Bronze coil springs used on electric-motor brushes were found suitable for the purpose.



Vertical Standard Guides Driver onto Lubricating Pit



By lining up the radiator cap with this standard, you can drive straight onto the grease pit

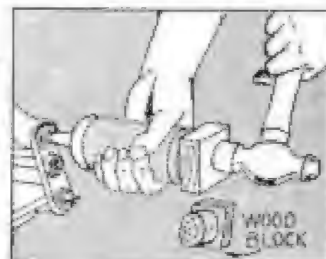
Set at the end of a grease pit, this standard serves as a guide for a driver when lining up his car to come onto the wheel treads. When approaching the pit, the driver merely lines up the radiator cap

with the standard, which assures him that the wheels are headed straight for the treads on each side of the pit.

—Opie Read, Jr., Chicago.

Installing Grease Fittings

A simple method of installing grease fittings of the drive-in type without special tools is to use the barrel of the grease gun as a driver. The end of the gun, which slips over the fitting, is exactly the same shape, so there is no danger of damaging it. To use the gun for this purpose, remove the plunger and put a wooden disk or block of the shape shown over the end to protect the edges and the threads from the hammer blows. As only a little force is necessary to drive the fittings home, the blows will not damage the end of the barrel in any way.—W. C. Wilhite, Edelstein, Ill.



The Next Issue

ALL ABOUT CORROSION AND HOW TO CHECK IT

Corrosion, from which no metal is wholly immune, may result from acid, from electrolytic action or from oxidation. Although it cannot be prevented completely, much can be done to minimize its action and effects, in the plumbing or heating system, in the car, or elsewhere.

MODERN TELEPHONE STAND AND BENCH COMBINED

Completely upholstered, this bench and telephone-stand combination, with its concealed bell box, makes a striking piece of furniture for an alcove.

FLEXIBLE MOLDS TO CAST PLASTIC ORNAMENTS

How to make flexible molds, and prepare imitation marble compositions, including magnesite cement in color, for casting plastic ornaments.

SUCCESS WITH SEEDS AND SEEDLINGS

Information on sterilizing soil, preparing and seeding hotbeds and cold frames to assure strong, vigorous growth of seedlings for transplanting.

PAINT THAT SHINES IN THE NIGHT

You'll find many uses for luminous paint, which you can make right in your workshop by following the simple instructions given in this story.

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SPORT

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Harley-Davidsons have always been easy on the pocketbook—but the new 1937 models take mileage costs to new low levels!

The answer is in the new improved Harley-Davidson motors with their many advanced features. Circulating pressure oiling—roller bearings throughout—improved cooling—four speeds forward—external ignition timer—all spell increased gas and oil mileage.

Greater economy, SURE — but that's only the beginning! You have to see and ride one of the 1937 Harley-Davidsons to get the real thrill of their classy lines, snappy colors—their double loop trussed frames, welded steel saddle-type tanks—and built-in instrument panel with its 120 M.P.H. speedometer dial!

See your nearest Harley-Davidson dealer NOW—take a FREE ride on one of the new models—ask about his Easy Pay Plans. And send in the coupon.

Los Angeles, Oct. 9th—News Flash—Bill Connelly and Fred Dauria cross continent from New York City in fastest time ever made by motorcycle. Their record—69 hours 46 minutes—beats former sidecar record by 17 hours 9 minutes. Exceeds best previous solo time by 1 hour 34 minutes. Their sidecar outfit—a Harley-Davidson—of course!



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My age is ☐ 16-19 years, ☐ 20-30 years, ☐ 31 years and up, ☐ under 16 years. Check your age group.

"For Digestion's Sake Smoke Camels!"

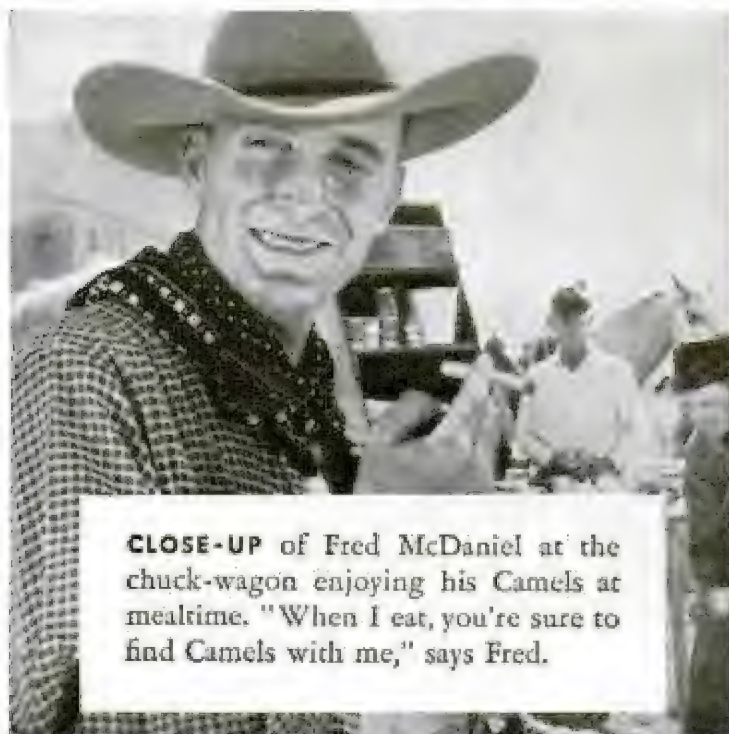
**"MIGHTY GOOD ADVICE," SAYS THIS
HARD-RIDING TEXAS COW PUNCHER**

AFTER riding herd from sun-up to sun-down, the chuck-wagon looks mighty good to me," says Fred McDaniel (*right, also below*). "But I'm sure I wouldn't enjoy my 'chuck' half as much without the pleasure I get from smoking Camels with my meals and afterwards. After a good meal and Camels I feel plenty O. K. Camels set me right! They're throat-easy, and they never get on my nerves." What Fred McDaniel says about Camels is backed up 100% by baseball's "Iron Man," Lou Gehrig—by Frank Buck, of "Bring 'Em

Back Alive" fame—by Eleanor Tennant, outstanding woman tennis coach—and by millions of other Camel smokers in all walks of life.

*Smoking Camels, you
enjoy a sense of ease while you're
eating, and afterwards too!*

Enjoy Camels at every meal. They speed up the flow of digestive fluids. Increase alkalinity. Help you enjoy food. Camels set you right! They're *the* cigarette for steady smoking. Light up a Camel any time and get an invigorating "lift."



CLOSE-UP of Fred McDaniel at the chuck-wagon enjoying his Camels at mealtime. "When I eat, you're sure to find Camels with me," says Fred.



BUSY SECRETARY. "I smoke Camels," says Joselyn Libby. "Camels put more fun into eating and smoking too. So many girls smoke Camels."



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Racing the Man-Made Meteors

(Continued from page 229)

chanical wheel lock are at the left of the instrument board. On the right side are the wing-flap and landing-gear switches, stabilizer controls, and hand gasoline pump, arranged so the pilot can reach across with his left hand to operate them.

Pilots try to fly a level course all through a race but some of them climb sharply while making a pylon turn. This is because unless the plane is banked vertically for the turn it tends to skid uphill. Ortman's plane has its engine pointed one degree to the right of center line to offset engine torque. This makes the plane fly level on the horizontal, but when it is banked to the left in a turn the engine tries to climb and the pilot must fight to keep from getting more altitude.

Pilots start their turns long before they actually get to the corners. They slowly start to roll the plane while approaching, planning to have the left wing tip pointed at the ground just as the pylon is reached. Then they can whip around the marker, clearing it by from ten to 100 feet, without sliding sideways. As they straighten out they roll back to the horizontal at the same slow speed.

Horsepower alone is not enough to win a race. In the Thompson contest Ortman was beaten by a French racing plane with about half as much horsepower. Another contestant with an engine only a quarter as powerful as Ortman's 850-horsepower radial averaged only fifteen miles per hour slower than Ortman. This was because the radial engine has a large frontal area while most racing planes are equipped with in-line engines that offer less wind resistance. The frontal area of an in-line engine is about one-fifth that of a radial, resulting in a saving of eighty per cent in head resistance. Radial engines give poor visibility ahead and frequently Ortman must dive his ship for a few feet to see whether he is approaching another plane.

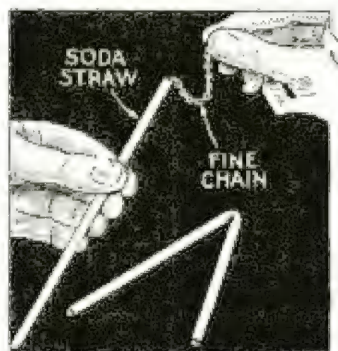
In-line racing engines are air-cooled and are mounted upside down in the planes. This inverted position keeps the crankshaft high so propellers with long blades may be used and at the same time places the engine low enough to provide good visibility. Instead of remaining in the crankcase and flowing down into the

cylinders, oil is kept in a separate reservoir and pumped in and out of the engine. Most racing planes land on tiny high pressure tires ten and one-half inches in diameter. Touching the ground at ninety miles per hour or more, the landing speed of most racing airplanes even when equipped with air brakes, is hazardous.

Pilots now are concentrating on newer, faster airplanes. In the last Thompson race an average speed of 264 miles per hour was established, although the winner, Lieut Detroyat of France, flew one lap at better than 300 miles per hour. Ortman is at work on a super-speed plane he hopes will have a top speed of from 380 to 400 miles per hour. The plane will cost \$50,000 or \$75,000, depending upon research not yet finished. It will resemble most racing airplanes of today, being planned as a low-wing monoplane with retractable landing gear, small control surfaces, and fitted with a 1,000-horsepower in-line, air-cooled engine weighing about one pound per horsepower. The fuel tank will hold just enough gasoline to finish a 150-mile race with enough to spare for circling the field before landing.

In the past, most racing airplanes have been financed by private persons and were often owned by the pilots who flew them. Soon some of the larger airplane companies may enter the racing field with specially built speed craft.

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Use two or three
Photoflood Lamps
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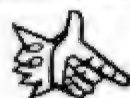
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INVENTORS Be Sure to See **Page 23A**

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BALKO ELECTRIC MOTOR & SUPPLY COMPANY
Dept. A12 10 S. Clinton St. Chicago, Ill.

Gunsmith Seeks World's Smallest Bore

F1346

(Continued from page 182)

or one-fifth as great produced at the muz-
zle. That is why the thickness of the bar-
rel wall at the muzzle of a gun is some-
times no greater than that of the strap
which holds your wrist watch in place.

Mr. Howe has gone so far as to make a
tiny needle-point cartridge suitable for
firing in a dwarf experimental gun of the
type which he ultimately hopes to pro-
duce. It is the smallest bullet of its kind
ever made, too small even to photograph
unless it be magnified. This experimental
cartridge is three thirty-seconds of an
inch in diameter, its caliber being .09, and
is approximately thirteen-sixteenths of an
inch long. The bullet is made of pure sil-
ver instead of lead because bullets of the
precious metals offer more satisfactory
ballistics tests and the experimenter may
best determine the proper center of form
for such tiny projectiles. The cartridge
shell is made of brass. It would require
about three grains of a fast-burning pow-
der like that used for a pistol or shotgun
to cause the silver bullet to be belched
from the tiny gun—when and if completed
—at a speed never before even remotely
approached. Mr. Howe estimates that it
will cost more than \$100,000 to produce a
satisfactory experimental midget gun and
test ammunition of extreme technical ac-
curacy for the high-velocity firing re-
search which he eventually intends to
make. It may be that he will have to de-
velop a sub-caliber rifle, a large chamber
within a small bore to produce the velocity
which he seeks.

This maker of all kinds of small arms,
who for fourteen years was in charge of
the small-arms experimental department
of the Philadelphia arsenal and whose
many patents have been used by both
American and foreign armies, predicts
that within the next decade the American
doughboy will be armed with a gun which
loads and fires automatically. It will re-
semble a machine gun, and a clip of car-
tridges will be good for twenty shots be-
fore reloading. This automatic rifle is now
in production but it will require nine or
ten years to produce an adequate supply

71346

for American troops to replace their present small arms.

Mr. Howe also predicts just as radical a change in the style of rifle used by the average sportsman. Automatics now rule the roost among sporting guns. The future trend, he thinks, will be to eliminate the automatics and revert to the single-shot rifle or shotgun. The idea will be to play fair with our rapidly diminishing wild life, to make the strife between the hunter and the hunted a better sporting proposition.

This Washington gunsmith reports that more guns used by sportsmen in this country are made in the home basement or shop than in the professional gunsmithery. Nowadays, American riflemen and shotgun users have also turned tinkers in large numbers. They reap as much fun from remodeling and repairing their firearms as other amateur craftsmen gain from carving or cabinetmaking and spend their spare time in home gun shops adjusting sights, decorating gunstocks, bluing and browning barrels, altering triggers to finer pull, engraving locks and barrels, carving wooden stocks and striving to improve the "hang" of their guns for maximum accuracy.

Most of these amateurs work with rifles as there is little chance for tinkering with shotguns which are designed for special shot loads. About all that can be done with shotguns in the way of alteration is to change the stock or engrave the barrel. The home tinkers, however, enjoy revising rifles and pistols. For example, the pistol enthusiast can alter the grips and sights, speed up the lock timing, stone down the trigger pull and otherwise subject his guns to "face-lifting" operations.

If you are a member of the National Rifle Association you can purchase either used or new army rifles of former types and patterns at ridiculously low prices. The model 1917 Enfield rifle costs \$7.50 for a used gun or \$20 for a new one. You can buy a Springfield 30-06 for \$34, the actual production price. The tinkers disassemble such rifles and fit them with barrels of other calibers. They also change the army rifle sights which are unsuitable for hunting purposes. Mr. Howe recommends the use of rear as well as peep sights for such made-over rifles. The military rifles generally have poor trigger pulls for the

(Continued to page 122A)

FOR THE FIRST TIME IN MOTORCYCLE HISTORY



Indian JUNIOR SCOUT

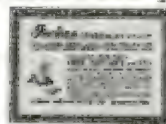
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Fig 346

sportsman and if he is well versed in rifle mechanics he may readjust the triggers, although ordinarily that is a job only the professional gunsmith can perform.

The present fad for muzzle-loaders is bringing much "artillery" of this type into use again. Many are making such weapons in the home shop. Mr. Howe received an order recently from a California sportsman who, as a youth in Kentucky, had hunted with a muzzle-loader. He wished a duplicate of that gun and offered some crude sketches. Howe used the action of a 45-70, a Springfield model of 1873, and fitted it with the barrel of a Winchester twenty-gauge shotgun. The gun as completed was technically accurate in all particulars. Amateurs should use the same high quality and demonstrated materials in their efforts. Mr. Howe warns sportsmen about the danger of overloading remodeled guns made of inferior metal. Many old-time guns were made of ordinary wrought iron. They are not qualified to withstand an overcharge even of black powder.

An over-and-under gun, one with one barrel directly above the other in vertical formation as contrasted to the pair of barrels mounted side by side in horizontal position, is superior to an automatic, believes Mr. Howe. It can be fired almost as rapidly as an automatic while it offers no visual obstruction even for a split second as does the ordinary double-barreled shotgun. One set of sights on the over-and-under gun serves for both barrels.

Fig 1540
Automatic Humidifier for Room
Fits on Steam Radiator



Performing the double duty of moistening the air and acting as a noiseless vent for a steam radiator, an automatic humidifier can be installed simply by screwing it in

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Maid C. Knight June 18 1922 Wacker Electric

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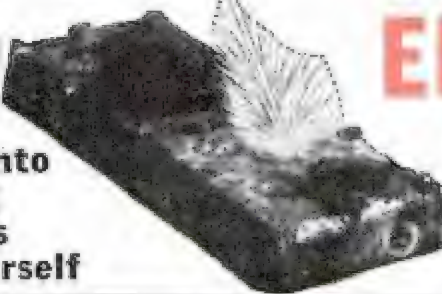
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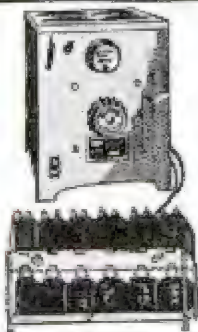
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The Home that Runs Itself

(Continued from page 245)

than gasoline or oats or lumber. The unit of measure is the kilowatt-hour and a kilowatt-hour will do more mechanical work than thirteen men can do in one hour.

Electrical rates generally are established on a sliding scale, so that the more "juice" you use, the cheaper it becomes. And that is the secret of Mr. Ripley's \$9.66 bill per month for about 400 kilowatt-hours of work as compared with a bill of \$3.84 he used to pay for an average of sixty-six kilowatt-hours. As he made fuller use of the Handy Annie he was employing in his home, he began buying electricity in wholesale quantities at bargain prices. He explains it like this:

"You don't get all the economies until you are all-electric, but the more electric equipment you use in your home, the lower the average rate per kilowatt-hour. So just remember that costs don't increase equally with consumption. Power is cheaper than light, and power—or work—is what I am buying.

"Here's the way my electric bill begins to creep instead of race as I increase consumption in a typical city like Schenectady. The first dollar of my bill buys seventeen kilowatt-hours, enough to run a washer with the strength of four women, a vacuum cleaner, a radio, a hand iron, clock and toaster.

"My second dollar buys twenty-two kilowatt-hours and that's enough to light the house fairly well. My third dollar buys twenty-five kilowatt-hours, enough to run a coffee-maker, waffle iron, cooker, grill, hot plate, fan, another clock and some more and better lighting.

"And right here is where most people stop—just at the point when they are ready to get a big bargain. The average electric bill for 21,000,000 American homes is about three dollars a month. Few know what happens after the third dollar. Well, in Schenectady the fourth dollar buys not seventeen, but thirty-five kilowatt-hours—more than twice as much as I got for the first dollar. And this is enough to run a good refrigerator, chafing dish, another fan, a vacuum cleaner upstairs, four more clocks and still more and better lights.

"The fifth dollar buys thirty-six kilowatt-hours and the sixth buys thirty-six

1223
more. And that's about enough, in our small family, to run the electric range and a kitchen ventilating fan, particularly as we do much cooking right on the dining-room table. The seventh dollar buys forty-three kilowatt-hours, two and one-half times what the first dollar bought, enough 'juice' to run an automatic oil or gas furnace that also heats our water.

"And now take notice. My eighth dollar buys sixty-six kilowatt-hours, almost four times as much work as my first dollar bought. That would be enough to run four washers, four vacuum cleaners, four irons, four clocks, four radios and four toasters. But to be practical, I added an ironing machine, another radio and a dishwasher in the kitchen, a clock in every room, a vacuum cleaner for each floor, more fans and more lamps.

"You are now really beginning to live electrically. You have an electric kitchen and an electric laundry. After this you will look into air conditioning and will investigate a room cooler. You will light your garden. You will begin to burn small lights all night and put 100-watt bulbs in modern efficient lights to save your eyes.

"And all of a sudden, you'll discover that you actually are using electricity like water—even more freely than water, perhaps, because while you don't let water run all night, you are using electricity twenty-four hours a day. Handy Annie is working while you sleep. And when you begin living electrically, you'll really find that you are living better at less cost because you're buying electric power—work—at bargain rates and using the money formerly spent in doing things the old-fashioned way to provide the tools for your Annie to do things the modern way.

"Based on my average rate of two and one-half cents, I can buy the mechanical work that an average farm hand would do in a month for about fifty cents.

"And, once you're completely electrified, you'll find your home actually does run itself. I know, because we went on a Caribbean cruise one winter and left our home to its own devices for eighteen days. We returned to find the automatic furnace still holding the temperature at sixty and the food in the refrigerator as fresh as when we departed. If that home didn't run itself, who ran it?"

(Continued to page 126A)

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GOLD LEAF**

*In Your Home
Workshop*



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Give your models and miniatures that professional finish. Decorate them with genuine gold leaf. Unlike so-called "gold" paint or bronze powder, gold leaf never tarnishes because it is made from genuine 23-karat solid gold, beaten so thin that one ounce of gold will cover an area of 200 square feet! It's fascinating to work with. So thin and delicate, you have to handle it with your breath. So brilliant and permanent, you'll want to put it on everything in sight! On your Fisher Body Guild coaches, your canoe, your book ends, your radio cabinet—on any of the 101 different useful articles and novelties that you make.

You can make money with the Hastings Home-Workshop Gold Leaf Kit, too—for the art of gilding is profitable. But buy the Kit for your personal satisfaction and as a long-needed accessory for your own workshop. No shop is complete without it. And look what this Kit contains:

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- 25 Sheets of Loose Gold Leaf (Genuine 23-Karat; 3½" x 3½")
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- 1 Lettering Brush
- 1 Striping Brush
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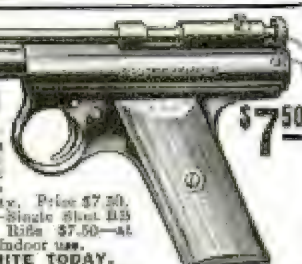
In the first place see that the surfaces to be joined, fit together as perfectly as possible, and that they are clean and dry. Then apply a thin coating of LePage's Liquid Glue. Let this dry a bit, then apply another coat. Place joints together evenly, using clamps if convenient. You needn't worry about those joints ever separating again. They're glued for life! Ideal for veneering and inlaying. LePage's Liquid Glue comes in tubes, bottles or cans. All are economical. All are on sale at your favorite hardware or drug store. LePage's Adhesives, Laboratories and Factory, Gloucester, Massachusetts.



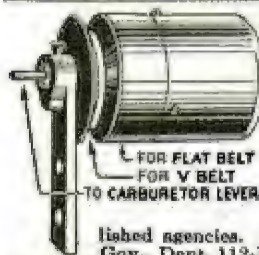
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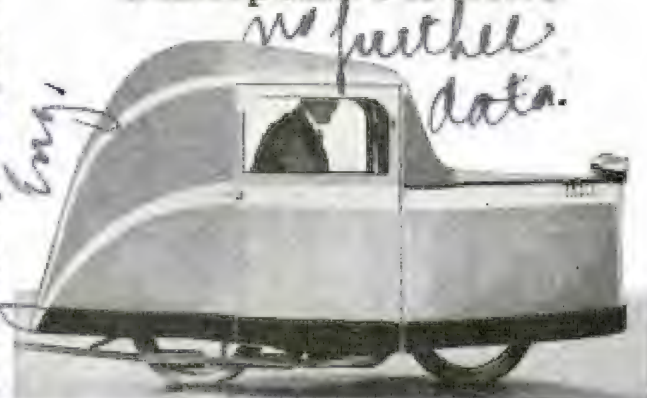
(Continued from page 125A)

And that's about all, except that this Handy Annie which runs Mr. Ripley's home so efficiently is employed on a part-time basis in more than 21,250,000 other homes. In 1935 the average housewife paid her sixty-six cents a week wages, but in that year she did forty-three per cent more work in American homes than in 1929 and twice as much as ten years ago, but got only fifty per cent more pay.

Imagine, if you can, the work Annie may be called upon to do some day when all these millions of homes begin using electricity as freely as water. That day, says Mr. Ripley, is near. It will arrive when others begin to find out what he has already proved—that electricity can run a home efficiently, easily and economically, and do a better job than the most capable of human hands.

"The part Annie will play in our homes in the future staggers the imagination," says the proud owner of the first all-electric home. "I believe that long before 1950 her work in homes will equal in usefulness—kilowatt-hours—all the work now done by electricity in all our mills, mines and factories."

Motorcycle Built Like a Coupe Is Inexpensive to Drive



© Planet News, Ltd.

No need to fear wet weather when your motorcycle has a coupe body like this English model

Is it motorcycle or automobile? A two-wheeled car built in London, England, has the lines of a coupe but the "works" of a motorcycle. The rider is protected by the inclosed body, and the vehicle maneuvers in traffic with the ease of a motorcycle.

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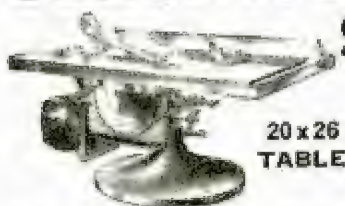
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Conquering Death After Dark

(Continued from page 215)

\$150,000,000," he says. "This is five or six per cent of the investment in these highways, assuming \$50,000 a mile the average cost. The annual cost of operating the 50,000 miles of safety lighting, exclusive of investment charges, is estimated at \$30,000,000 to \$50,000,000. The total lighting cost, based upon the claim experience of casualty underwriters, is less than one-third of the losses, from the accidents which would be prevented by the lighting!"

Let's take the top figure for installation and the top one for operation. Operating the lights for ten years would cost \$650,000,000. In that period there would be saved at least 50,000 lives—the cost per life \$13,000. But we would also save 100,000 personal injuries and 1,000,000 cases of property damage costing millions of dollars in economic loss.

Here's another way of looking at it. New York state authorized a bond issue of \$300,000,000 for the elimination of grade crossings. At three per cent interest and amortized over fifty years, that involves an annual expenditure of \$12,000,000. Now in 1935 New York had 156 grade-crossing accidents and an estimated 10,000 night highway accidents which could have been prevented by spending \$12,000,000 for lighting. So the cost of preventing one accident by eliminating grade crossings is more than \$75,000, compared with an estimated cost of \$1,200 for preventing one accident involving a fatality or personal injury by highway lighting.

This opportunity for conserving life, limb and property by highway lighting has stimulated research into light sources and their application. Three main light sources are being employed today as a result of this research—incandescent lamps specially designed for the purpose, sodium-vapor lamps with an efficiency of light production nearly three times that of the incandescent, and the high-efficiency mercury-vapor lamp, giving nearly twice as much light per watt as the incandescent.

The lighting studies also have involved such factors as the reflecting value of various road surfaces, the best height for light standards and the proper spacing between them, and the most efficient reflectors. It has been found, for instance, that

as a general rule, light coming to the pavement and reflected toward the driver is the effective light in building pavement brightness. Pavement brightness is important since most of what we observe when driving at night is seen in silhouette.

Where demonstration sections of safety lighting have been installed for observation and study, amazing decreases in night accidents have resulted. Two installations in New York state decreased night accidents more than thirty-six per cent although day accidents increased more than nine per cent, along with increasing traffic. On the Bay Shore highway in California, night accidents decreased forty per cent after lighting. The accident rate on one of sixty lighted sections in New Jersey was less by night than by day; on adjacent unlighted roads the rate at night was three times that by day. On two New York installations, night accidents increased thirty-seven per cent when lighting was reduced, and after lighting was discontinued on the Mt. Vernon Memorial highway near Washington, night accidents increased two and one-half times.

Due to the great improvement in seeing provided by the newest developments in highway lighting, not available when the early installations were made, lighting engineers estimate that fully one-half of all night highway accidents could now be prevented by safety lighting.

Since about one-half of all highway accidents occur at night and about seventy-five per cent of all night accidents occur on about 50,000 miles of heavily traveled highways, a reduction of one-half the night accidents on this 50,000 miles would represent a reduction of about eighteen per cent in the total highway accidents.

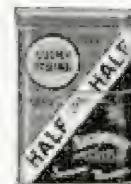
And that, in turn, would mean a saving of about 6,500 lives a year, or 65,000 lives in a period of ten years. Based on 1935 accident figures, it would also represent an annual saving of more than 18,000 cases of permanent disability, more than 100,000 cases of temporary disability and more than 1,000,000 cases of property damage.

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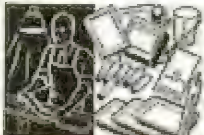
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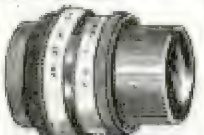
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Write name, address on margin if you need more space, or send postal.

Tuna Fleet Battles for "No Man's Land"

(Continued from page 207)

demand for tuna as food. And as long as catches are made with hook and line, I predict these fish never will become extinct."

Meanwhile the first boats of a fleet of six Japanese fishing cruisers, each equipped with facilities for canning tuna aboard, have appeared in western Pacific waters. These big craft, several times the size of the clippers, are initiating a type of competition heretofore unknown to the American tuna industry. Although the exact details of the foreign boats are not made public by the Japanese, it is known they plan to make only two round trips a year.

American tuna clipper owners believe the efficiency of their new fleet will enable them to withstand any competition from other nations. Plans are maturing for a commercial tuna fishing school—a ship where student fishermen will be taken on a test cruise for several weeks while they learn to recognize the different kinds of tuna on sight, and are taught the technique of fishing, how to care for gear and gain some knowledge of seamanship. It is believed this scheme will create a reservoir of trained tuna fishermen upon which the industry in the United States may draw, thus adding another spoke in the wheel of efficiency with which California fisheries hope to maintain supremacy.

"Window" in Lady's Long Glove to Read Wrist Watch

One woman solved the problem of reading her wrist watch while wearing long gloves by providing a small opening in the glove. If desired, a piece of celluloid may be sewed in, and, of course, the edge of the opening should be hemmed to provide a neat appearance.



6 WEEKS AGO SHE SAID: "HE'S TOO SKINNY!"



Posed by professional models

NEW DISCOVERY GIVES THOUSANDS 10 TO 25 POUNDS — *in a few weeks!*

If you seem "born to be skinny"—if you've tried everything to gain weight but with no success—here's a new scientific discovery that has given thousands of happy men just the pounds and solid heftiness they wanted—and so quickly they were amazed!

Not only has this new easy treatment brought solid, naturally attractive flesh, but also normal color, new pep, and the many new friends these bring.

Body-building discovery

Scientists recently discovered that thousands of people are thin and rundown for the single reason that they do not get enough Vitamin B and iron in their daily food. Without these vital elements you may lack appetite, and you don't get the most body-building good out of the food you eat.

Now one of the richest known sources of Vitamin B is cultured ale yeast. By a new process the finest imported cultured ale yeast is now concentrated 7 times, *made 7 times more powerful*. Then it is combined with 3 kinds of iron, pasteurized whole yeast and other valuable ingredients in pleasant tablets.

If you, too, need these vital elements to aid in building you up, get these new Ironized Yeast tablets from your druggist today. Note how quickly they increase your appetite and help you get more benefit from the body-building foods that are so essential. Then day after day watch flat chest develop and skinny limbs round out to natural attractiveness. See better color and natural good looks come to your cheeks. Soon you feel like an entirely new person, with new charm, new personality.

Money-back guarantee

No matter how skinny and run-

down you may be from lack of sufficient Vitamin B and iron, these new "7-power" Ironized Yeast tablets should aid in building you up in just a few weeks, as they have helped thousands. If not delighted with the benefits of the very first package, your money instantly refunded.

Only be sure you get genuine Ironized Yeast. Don't let anyone sell you some perhaps cheaper yeast and iron tablet, which is not the original Ironized Yeast that has been so successful. Look for "IY" stamped on each tablet.

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To start thousands building up their health right away, we make this FREE offer. Purchase a package of Ironized Yeast tablets at once, cut out the seal on the box and mail it to us with a clipping of this paragraph. We will send you a fascinating new book on health, "New Facts About Your Body." Remember, results with the very first package—or money refunded. At all druggists. Ironized Yeast Co., Inc., Dept. 532, Atlanta, Ga.

F 1155 Around the World by Air

(Continued from Colorado Section)

"Where did you go?" they ask.

"Oh, just around the world," you reply airily. "Europe, Asia, the Atlantic, the Pacific—all those places."

You'll get your "air legs" under you on the first leg of your trip, that jump across the Atlantic on the "Hindenburg." From spring to fall its schedules across the north Atlantic are maintained with almost clocklike precision. After October you can cross until December by taking the "Graf Zeppelin" from Rio de Janeiro and utilizing a Clipper ship of Pan American for the trip south. In a year or so, you will probably be able to cross the Atlantic as well as the Pacific by plane. Two or three airplane routes across the Atlantic already are being surveyed. But at present the "Hindenburg" offers you the fastest transportation.

Traveling on this dirigible is like taking a trip on an ocean liner supported by air instead of water. In size alone it compares favorably with an ocean greyhound. It is the biggest Zeppelin ever built, more than 800 feet long, is powered by four Diesel motors of 1,200 horsepower each, has a cruising range of 8,750 miles, carries a crew of forty and has accommodations for about seventy passengers. A sister ship as big will be ready next summer.

The passenger quarters on the "Hindenburg" are confined to one section entirely within the ship's hull and constructed on two levels. There are twenty-five state-rooms in the main section, each containing two berths; four public rooms including a large dining room, lounge, writing room and smoking room; two promenades, kitchen, officers' and crew's mess rooms, bar, shower bath and lavatories. Windows along the promenades on each side of the vessel provide ample visibility for all public rooms in the daytime but the cabins have no outside exposure. The quarters are supplied with heating and air-cooling systems, walls are insulated with aluminum foil and exhaust gases of the motors are used to preheat fresh air carried into the passenger rooms.

The walls of the smoking room are covered with a veneer of pear wood which, like asbestos, does not burn. All other rooms are covered with balloon cloth. The

furniture is made mostly of duralumin and there's an all-metal piano. Besides the berths, cabin furnishings include a washstand with mirror and hot and cold running water, writing ledge, chair and clothes closet. Washbasins can be folded back against the wall when not in use and the upper berth also is of the disappearing type to provide extra room in the daytime. All cooking and refrigeration is electrical, the current for the ship being supplied by two generators driven by two fifty-horsepower Diesel engines.

And when you ride the "Hindenburg," don't think for a minute that you're doing anything unusual. Up to late 1936, the "Graf Zeppelin," similar but smaller dirigible, had made 557 trips, including 125 ocean crossings and a voyage around the world, carrying nearly 13,000 persons, 5,500,000 pieces of mail and many tons of cargo. The trips of these German airships to the United States are just about as routine as the passages of surface liners.

Once at Frankfort, you're ready to begin going places in a big way—if you have passports, visas and other credentials in order. Be sure you have, because many of the countries are fussy about strangers without credentials and you may find your journey ended unexpectedly if your passports are not in order.

From Frankfort you can go by plane to London, Paris or Rome, according to the air line you intend to follow across Europe. If you travel by Imperial Airways, for instance, you can pick it up in London and be in Singapore eight and one-half days later, going by way of Paris, Brindisi, Alexandria, Bagdad, Delhi and Calcutta. You end this leg of your journey at Saigon, Penang, Singapore or Hongkong, depending on the eventual connection made with Pan American Airways at Manila. At present, of course, there is an 850-mile trip by boat but this gap in the air service is almost sure to be closed soon.

Over Imperial Airways you'll probably fly one of its double-deck air liners. Most of these great ships are powered by four engines and carry from a dozen to forty passengers, depending on the particular type used on the route you happen to se-

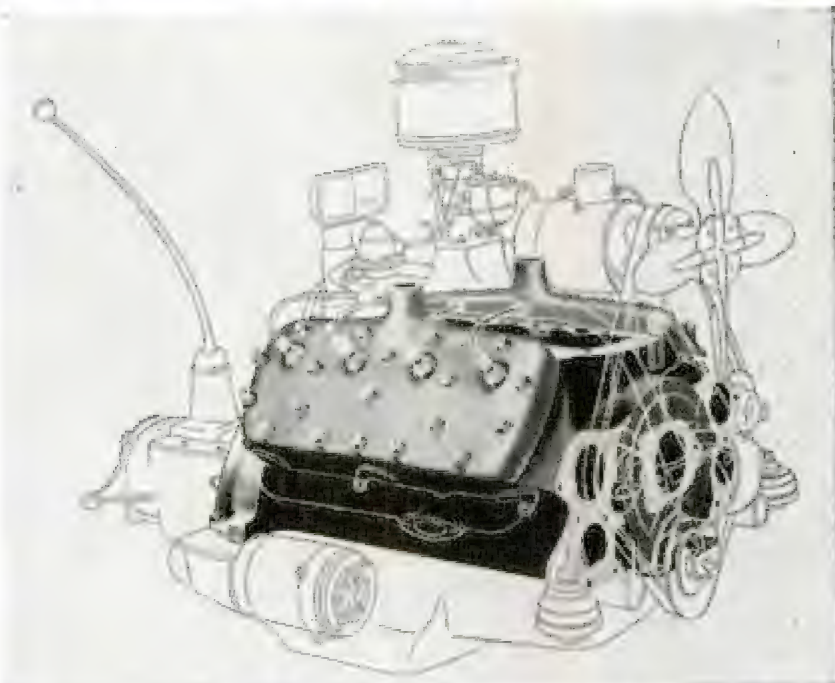
(Continued to page 134A)

FORD OWNERS ALONE ENJOY THIS MONEY-SAVING FEATURE Engine and Parts Exchange Plan

You may never need to have your Ford V-8 engine overhauled. But if you should, after thousands of miles, you'll appreciate the time and money-saving advantages of the Ford Engine and Parts Exchange Plan.

Through this plan you can exchange your Ford engine for a factory-reconditioned engine at a big saving over the cost of an engine overhaul. A complete engine overhaul usually costs well over \$85. A Ford factory-reconditioned engine may be installed for \$56 (slightly more west of the Rocky Mountains). This includes reboring of the cylinders, new pistons, piston pins, piston rings, bearings and valve springs. Crankshaft, camshaft, valve lifters, valves, retainers, timing gears and oil pump are either rebuilt or replaced with new ones as needed.

Many other reconditioned Ford parts, too, are available at remarkable savings to Ford owners—savings made possible by Ford mass



Phantom view of Ford V-8 engine, showing parts included in Engine Exchange Plan in solid black.

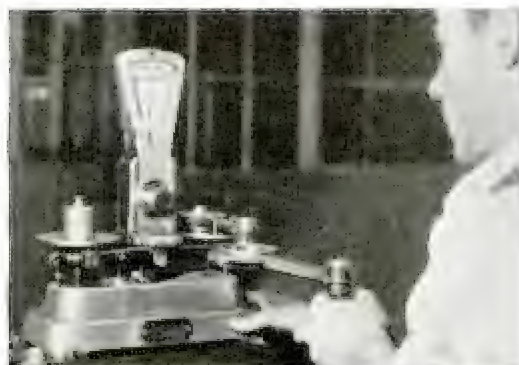


(Above) Reconditioned engines are block-tested and given the same rigid inspections as new engines.

production methods. In the case of all Ford reconditioned engines and parts, experienced workmanship, quality materials, precision manufacturing methods, rigid tests and inspections are the same as in the building of new Ford engines and parts.

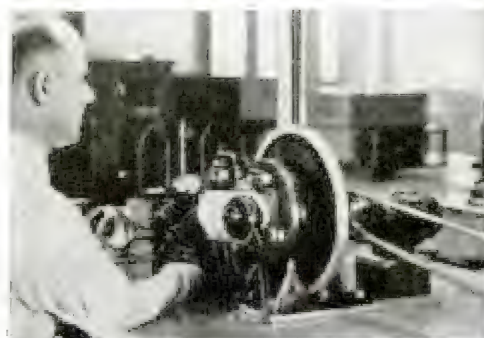
Ask any Ford dealer or any garageman who displays the sign, "Genuine Ford Parts," to give you complete details of the Ford Engine and Parts Exchange Plan.

FORD MOTOR COMPANY
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All reconditioned parts are subjected to final tests on performance and adjustments. Photo at right shows a reconditioned distributor receiving final test.

Parts used in reconditioning the engine are tested and inspected with the same care as parts used in new engines. Photo at left shows inspector checking weight of connecting-rods on sensitive balance.



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F 1155

(Continued from page 132A)

lect. You'll find these European planes as spacious as a Pullman car.

And from the time you start from New York, don't worry about where to eat. Meals are included in your fare on the "Hindenburg" and over virtually every air line you will fly. For the most part, you will fly by day and sleep on the ground, and hotel accommodations also are generally included with your air transportation. And there are no tips. Your air fare covers virtually everything.

(Concluded next month)

F 1493

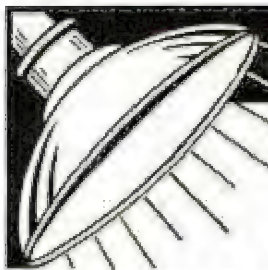
"Pillbox" for Executions by Gas Replaces Noose in Wyoming



Death chamber showing chair in which prisoner is strapped before lethal gas is turned on

Since lethal gas has replaced the gallows as the legal method of executing criminals in Wyoming, an airtight death chamber has been built for the state. The doomed man is strapped in a chair in the metal "pillbox," the door is latched and the chamber flooded with gas.

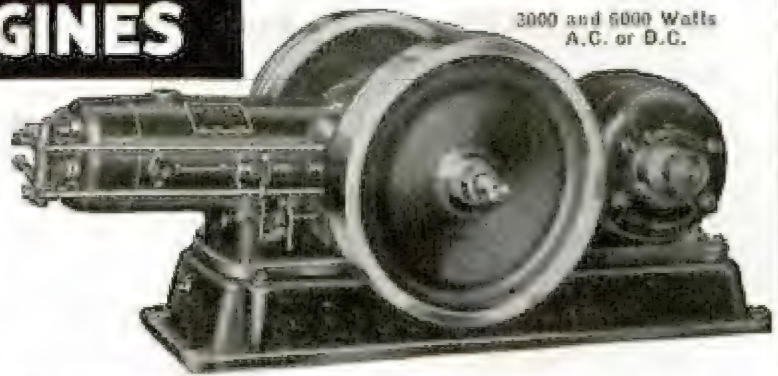
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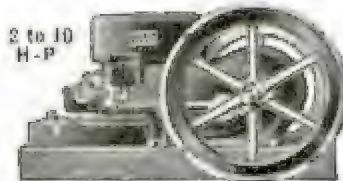
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Without obligation, send me new 1937 Catalog and 30-day trial plan.
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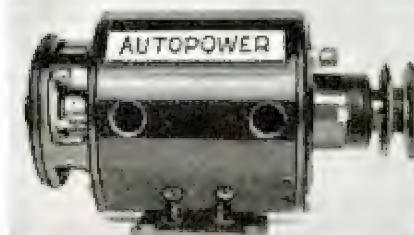


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Works like a card index. A flip of the wrist opens the case. Six sizes. Ask your dealer or write to

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Send me free copy of "Disston Saw, Tool and File Manual."

Name.....

Address.....

The Master Man of Radio

(Continued from page 253)

each watch. They are rated as the senior control supervisor, junior control supervisor, and the switchbank operator.

As an adjunct to the master control board, there is a short-wave transmitter used for "cue" channeling. This transmitter is useful for talking back and forth when a portable short-wave broadcasting truck is dispatched to pick up some special event at a remote point. The special events director in Radio City carries on a running conversation with the field force while the remote pick-up is going out on W.E.A.F.'s regular channel. This conversation takes place on a seven-meter wave. Without this short-wave arrangement, it would be difficult to transmit "go ahead" cues to the portable transmitter.

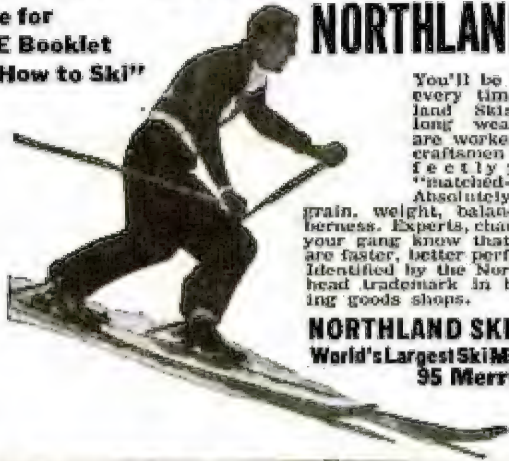
The master control room's most common function is the routing of channels from studio to studio. This is accomplished by means of relay switchbanks, of which there are sixteen in all. Each switchbank set has fourteen keys, above each of which is a white light representing one of the fourteen available channels for every program. Above the switchbanks are sections of keys and lights pertaining to each studio. Each key and light corresponds to a switchbank.

Both switchbank and channel are "pre-set" by the operator. That is, if a program is scheduled to go off at seven o'clock, the switchbank operator sets his keys at 6:55 o'clock so the shift from one studio to the next takes place automatically at seven p.m. What actually happens is this. At seven o'clock sharp, the announcer in the studio to "go off" pushes a release button which drops all channels. Simultaneously, the announcer in the studio to "go on," receives a green light signal. He presses a set-up button which automatically picks up the switchbank which has been pre-selected.

Although it is usually carried out by the switchbank operator, the master control supervisor can carry out the same sequence from his central position. So far as dropping and setting up channels are concerned, the master control desk and the announcer's control panel in the studio are in parallel. Hence two points of control are provided for each program.

SHOW YOUR GANG SOME REAL SKIING ON NORTHLAND SKIS

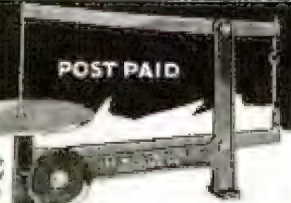
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on "How to Ski"



You'll be out in front every time on Northland Skis. Choice of long wearing woods are worked by master craftsmen into perfectly proportioned "matched-pair" skis. Absolutely uniform in grain, weight, balance and limberness. Experts, champions, even your gang know that Northlands are faster, better performing skis. Identified by the Northland Deer-head trademark in better sporting goods shops.

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Including 12 assorted blades, Adapters, Illustrated Manual, and roller Saw Guide formerly found on expensive machines only. All metal, 15" long, 8" high, 6 1/2" table. A swift and easy cutter—best ever made for the money.

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Newest Ride Thrill—Sweeping the Nation. Easy to ride—easy to park. Wonderful for pleasure—school—deliveries—business. 140 miles on a gallon of gas—30 miles per hour. Safe—Economical and lowest priced motor transportation. Reliable, powerful Cushman Engine, balloon air wheels, drum brake clutch, cushion seat, channel iron frame, steel carrier, lights and horn.

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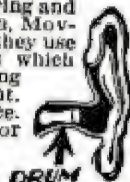
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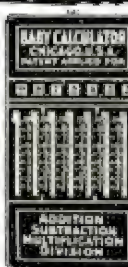
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Harbor Pirates on the Run

(Continued from page 197)

boat, the "Gypsy," are famous around the water front. The "Gypsy" outsmarted the rum runners often and engaged them in many a running battle. The rum smugglers never obeyed orders to heave to but would jettison their cargo if overtaken,



Harbor police boat cruising along the New York water front on the lookout for pirates

and fight to the last ditch. Present-day harbor pirates usually do not care to risk a gun battle with the police. They try to escape at the first alarm because they would rather run than risk a fight with the special patrol organized and trained to combat modern freebooters.

Copper and Asphalt "Sandwich" Forms Self-Healing Roof

Thin sheets of copper sandwiched between layers of asphalt form a durable



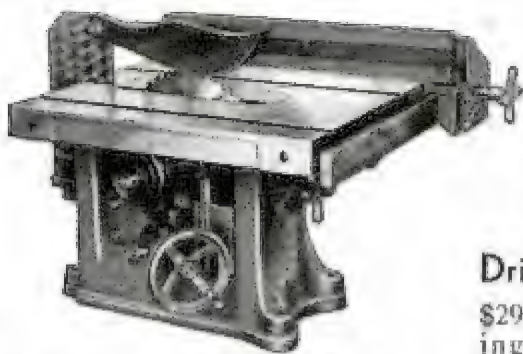
material for roofing, or lining refrigerators or shower stalls. The asphalt is impervious to moisture and protects the copper from corrosion. In addition,

the asphalt has a self-healing tendency, its surface closing together after being punctured and thus preventing leaks. This type of construction material is made possible by development of pure copper sheets so thin they are as flexible as sturdy cloth.

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—the 1937 Driver Power Tools offer far greater values for the money. Features ordinarily found only in more expensive equipment are incorporated in these models.

Perhaps you are buying your first power tool, or enlarging your workshop. In either case you owe it to yourself to study carefully the many points of superiority that characterize Driver Engineered Tools for 1937.

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\$29.95 as shown, including 72 pg. Instruction Book. Driver Engineering has lifted this Jointer out of the usual 4" jointer class. It is longer, heavier, more accurate and far more durable. 28" overall length. Machine ground table. SKF sealed, dust-tight ball bearings. Geared tilting fence 24" long. From the standpoint of convenience, utility and dependability it has no equal—it's Driver Engineered.



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1937 BOICE-CRANE CATALOG

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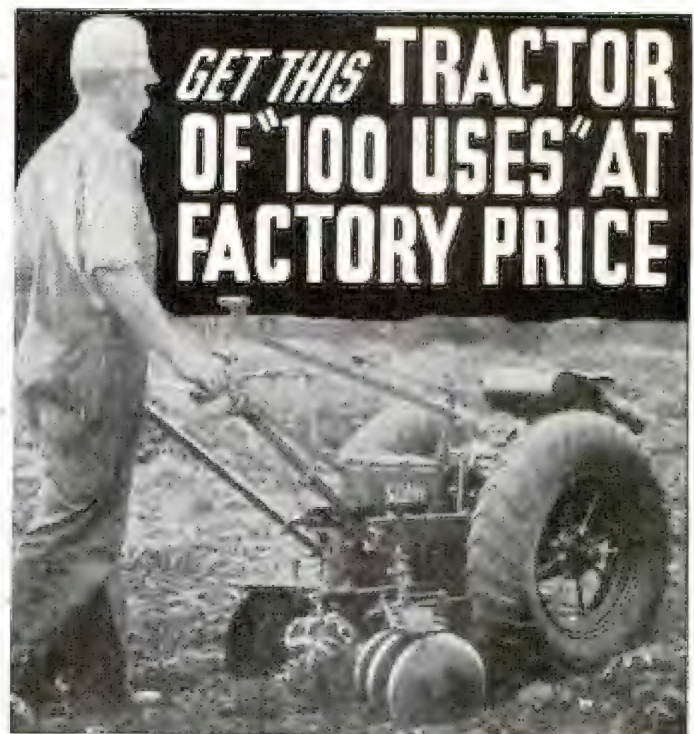
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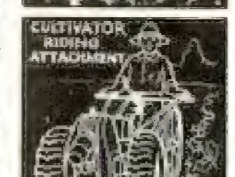
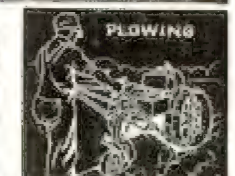
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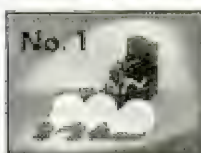
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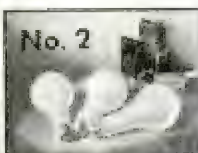
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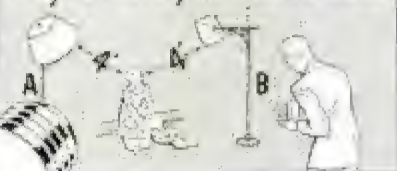


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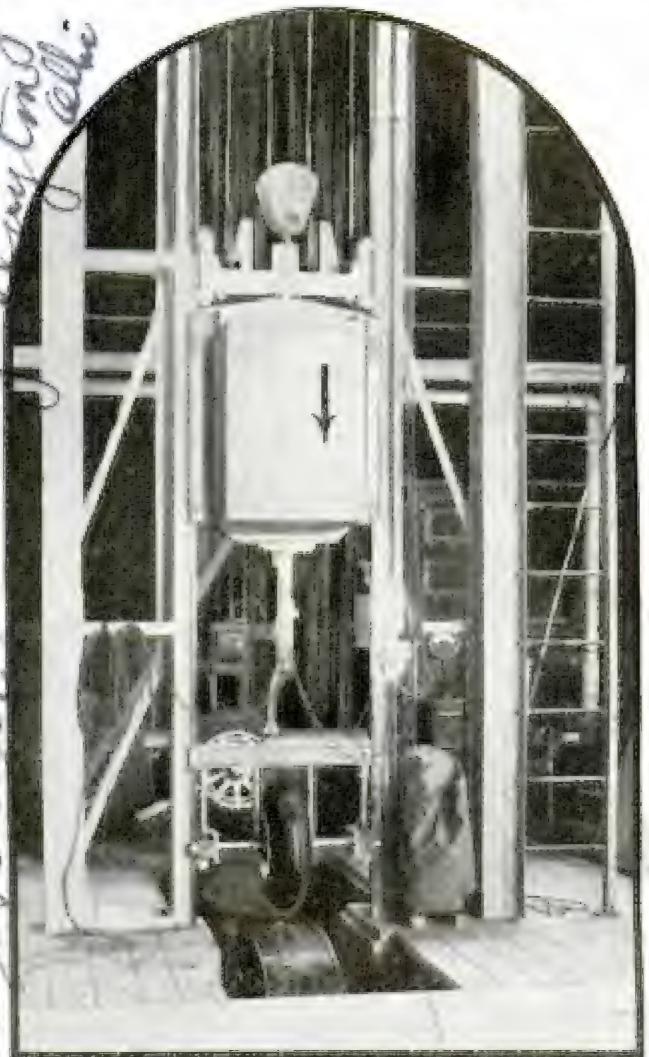
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Conditions encountered by an airplane on landing are duplicated with an ingenious rig and friction wheel in the laboratory at Wright Field, Dayton, O., where tires and shock absorbers for bombing planes are tested. A revolving wheel is built into the floor to simulate the "rolling" effect of the ground on an airplane landing gear. Dynamic test rigs for landing gear previously could duplicate only the general effect of landing, and not the added stresses imposed by the "roll" of the ground. The friction-driven wheel in the test rig can be rotated at speeds up to sixty miles an hour, the fastest landing speed of the bombers. A steel box suspended from a crane is loaded with lead blocks equal to half the weight of the airplane. One shock absorber, wheel and tire unit are fitted in a special frame under the load which is raised and dropped on the revolving wheel. A recording mechanism shows the load taken up by the shock absorber and the stresses on the tire.

Emb. Charles T. Bauer, 30 Dayton Daily News

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F1482

Noise Fighters Battle for Quiet

(Continued from page 190)

has no structural connection with the surrounding building. The floors, walls and ceiling are of concrete, and the whole room "floats" on a bed of dry sand underlaid with gravel.

Another field of inquiry for the noise fighter is the measurement of sound transmission and sound isolation properties of walls, floors, and partitions. On the third floor of Johns-Manville's laboratory, any type of wall or panel can be built to order. By producing vibrations and sounds on the third floor and picking them up on the second floor, or vice versa, a complete study can be made of the sound-isolating value of various floor constructions.

Noise fighters call the sound boundary between comfort and discomfort the "psychological boundary." This term is now used commonly in the sound-conditioning of transports. Investigators of the Sperry Gyroscope company have determined that the comfort level for airplane passengers lies below eighty-five decibels. The discomfort range lies between eighty-five and 120 decibels. Beyond 120 decibels noise is no longer a discomfort, but a positive pain, unbearable to the average person and injurious to his health.

Uncomfortable vibrations are commonly associated with noise. Vibrations, therefore, come under the jurisdiction of the noise fighter. It is not difficult to cushion an airplane chair seat, but it is equally important to cushion the armrests, the sides, and all other parts with which the occupant comes in contact. Vibrations of more than eight-thousandths of an inch—tissue paper thickness—may cause a passenger to hold his muscles tense, making it impossible to relax.

Five years ago, the interior of an airplane cabin was like a boiler factory. The passengers were given cotton to place in their ears, and conversation at ordinary levels was impossible. The modern air transport has cabin walls covered with a synthetic, washable, and fireproof fabric. Window glass is flexible and fits into the openings snugly. The lowest noise level in an airplane cabin is probably inside the new Wibault transports, built for Air France by the French Air Ministry. The sound-conditioning of these planes was

placed in the hands of an American engineer. At 200 miles per hour the noise in the Wibault cabin is not above sixty-four decibels; it is seventy-two in the cockpit and seventy-six in the bar.

The time when all noise will be eliminated from an airplane cabin seems remote because the difficulties are great. But at the lower noise levels, obtainable in modern air transports, passengers feel perfectly comfortable.

The noise fighters begin their job while airplanes are still in the blueprint stage. They now have much to say about the location and thickness of partitions, and even the location of motors. The old aircraft motor was fastened to a solid base. This method of construction transmitted engine vibrations to every part of the ship. Today motors are cushioned and placed as far from the cabin as practicable.

The old cabin walls made of metal or paneled wood became huge diaphragms or sounding boards under the influence of motor vibrations. The present cabin walls are carefully insulated with "kapok," a vegetable fiber from Java. It is non-hydroscopic, and when combined with a small percentage of paper can be suspended inside a wall. It weighs only one-tenth of a pound per square foot. Three layers of kapok usually form the soundproofed walls and ceilings of an airplane. The first layer is stuck fast to the cabin walls, the second suspended about two inches away, and the third about the same distance from the second.

Fast Lens Sees Rubber Band Rebound Four Times

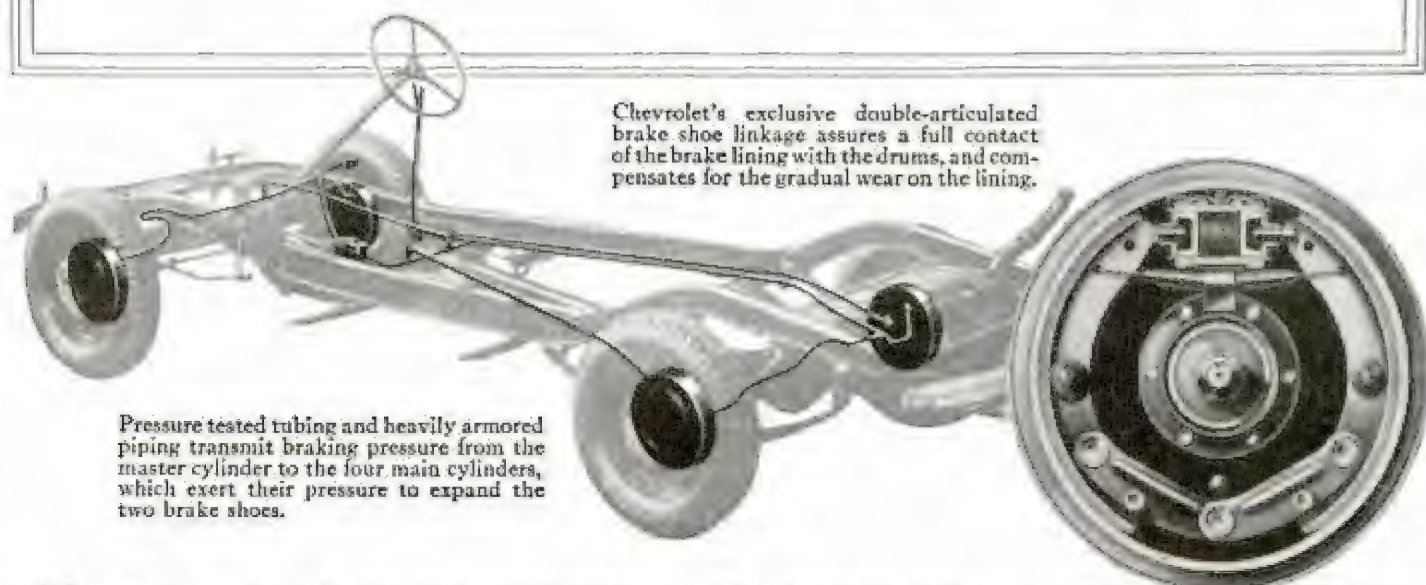
Stretch a rubber band between your fingers until it breaks. Your eye is too slow to see what happens, but ultra-fast motion pictures show that the ends of the broken band snap back to your fingers and bounce out again not once, but four times. Speed cameras developed to study industrial processes can record 2,000 to 3,000 pictures per second. Instead of speeding up the mechanical shutter to that pace, an intense light which can be switched on and off 3,000 times in a second is used.

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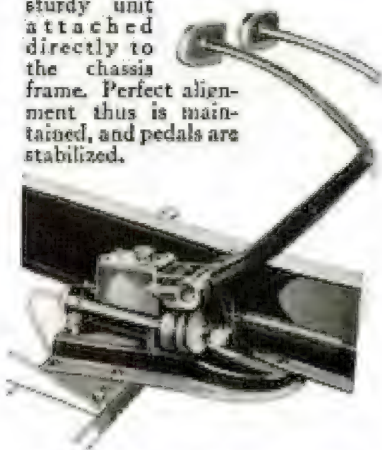
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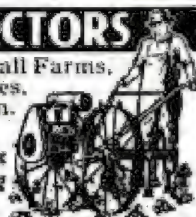
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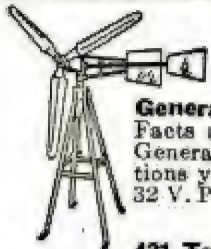


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Receiver from Junk-Box Parts

(Continued from page 260)

and held in position by means of 6-32 nuts. The switch levers can be purchased in the 5-and-10-cent stores, or made from the sliding arm of an old variable resistor unit.

No. 18 or 20 double-cotton covered wire, or the bell wire used for the coil, may be employed for the various circuit connections. When tapping the coil, lift the turn to be tapped with an ice pick or similar pointed instrument and insert a short length of match stick under the turn to hold it up while removing the insulation preparatory to making the soldered connection. It will be noted that one switch lever is connected to the antenna and the other goes to one side of the crystal.

Fig. 2-B shows the arrangement of the coil and tuning condenser in the cabinet. The antenna and ground posts are extended on brass bushings to place the clips within easy reach. However, the terminal clips may be screwed directly to the wood bottom of the cabinet if preferred. These spring clips were salvaged from an old B-battery. Mount the variable condenser on the wood base and extend the shaft through the wood front panel. The shaft of the condenser shown in the photo was not long enough to reach through the panel therefore a connector bushing and a short length of 1/4-in. brass rod were used to bring it out to the dial. Almost any type of tuning dial may be used.

To place the receiver in operation, use a good long antenna from 100 to 200 ft. in total length. No. 14 enameled-copper wire is easily obtained and recommended for best results. A ground clamp on a cold-water pipe completes the installation. Switch No. 1 acts as a selectivity control, while switch No. 2 places the antenna and ground circuit across different portions of the coil. This switch and the variable condenser regulate the wave length of the receiver. A good pair of 2,000-ohm headphones is necessary with any crystal set. A complete material list, including construction details for the cabinet, can be obtained from Popular Mechanics radio department upon application without charge.

During tests with this set, programs from powerful local stations could be heard across the room when the phones were placed on the operating table.

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Model B-10 DUTCH WINDMILL, 32 in. high (Hexagon style).....	.75
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(Note: Color arrangement included on all patterns. Trace direct to wood.)

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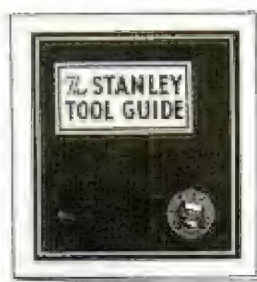
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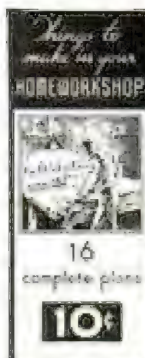
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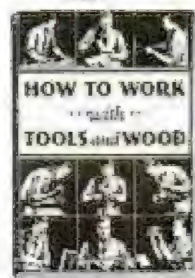


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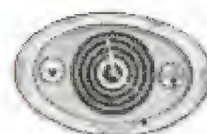
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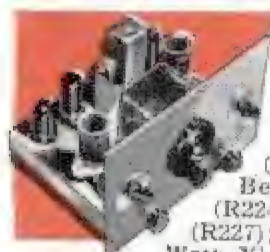
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Tunes 3 full bands—brings you the world—powerfully, dependably. Metal tube circuit—RCA and Hazeltine licensed—gives fullest sensitivity—reaches out farther—perfect reception, powerful performance on every band. New 12" Vita-Tone Speaker. New 11" Magna-Span Dial with every new and exclusive device for simplified tuning. Beautiful rolled-top console cabinet. See full description on pages 8-9 of **ALLIED's Free Catalog**.



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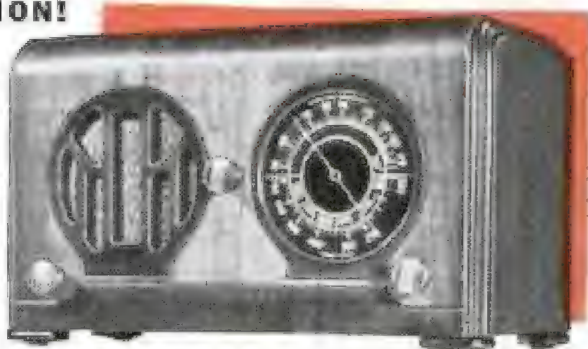
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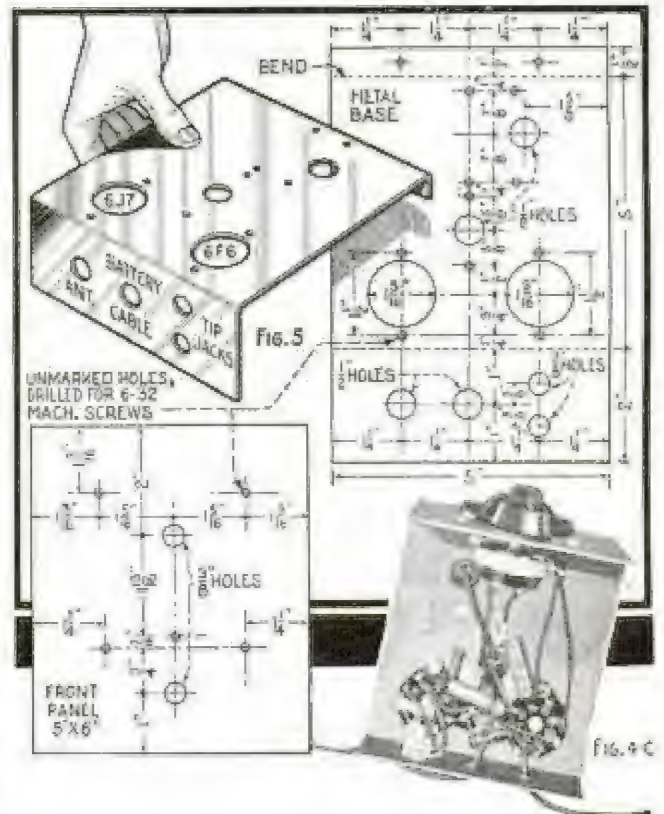
Goodrich
KATHANODE
Electro-Pak BATTERY

Portable 2-Tube Emergency Set

(Continued from page 259)

the set. Note that the antenna is fastened directly to the cathode of the detector tube instead of through a condenser into the grid as in common practice. This permits maximum coupling without the usual loading or damping effect.

Assuming that the builder already has a set of headphones, this little set can be built for about \$5.00, including tubes. A list of the original parts used can be obtained from Popular Mechanics radio de-



partment upon application, without charge. The blueprint number is R-234. To place the receiver in operation, clip the battery leads across the 6-volt battery as shown in Fig. 1, turn on the switch which is combined with the regeneration control and throw the attached 25-ft. flexible rubber-covered antenna out the window, or support it in any convenient manner. A 50-ft. antenna is best for distance but tunes broad on locals. Adjust the regeneration control about half-way in, and tune over the dial until you pick up a whistle which indicates a station. Now back off the regeneration control to a point where the station comes in clearly. Extremely weak distant signals will be heard best with the regeneration control set where it is just ready to spill over into oscillation.

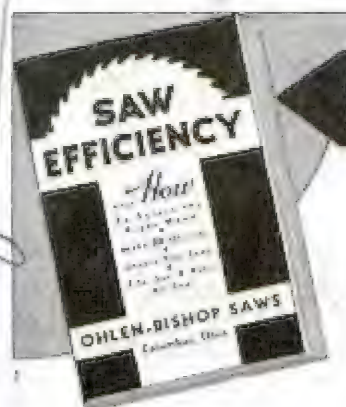
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Paramount Products Co., Dept. 3A, 245 Bd'y, New York, N. Y.



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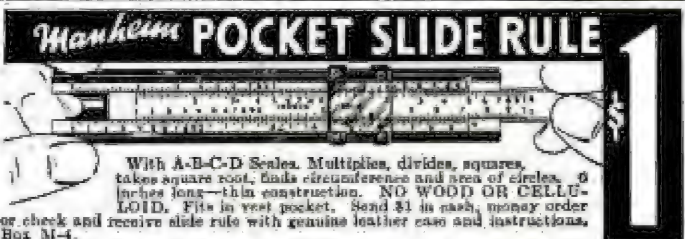
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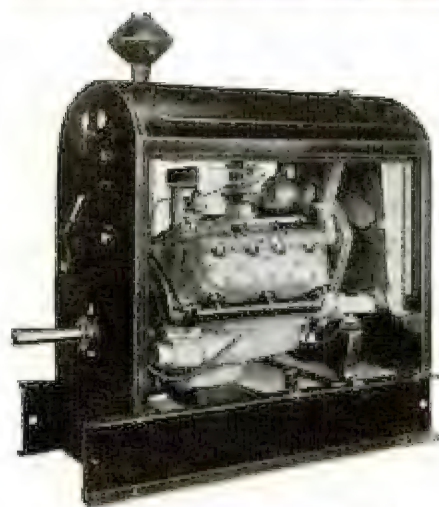
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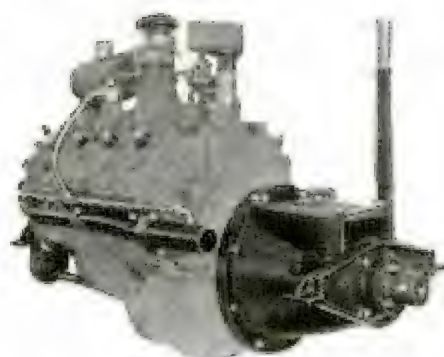
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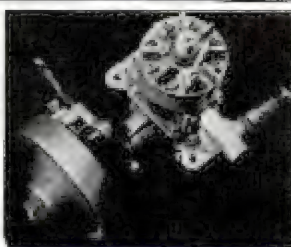
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71588.

The Buried Treasure Racket

(Continued from page 163)

in front of witnesses, go directly to it with the aid of a divining rod and dig it up. The makers of such instruments cleverly avoid guarantees by which they can be held. One company states its device is "designed to locate buried treasures," instead of asserting it is actually capable of finding them. Another announces "this machine works on psychological principles and is governed by the same natural laws as the original divining rods." In this statement psychology is nothing but a big word. The only physical law that has any influence on divining rods is gravity, a force that acts equally well on peanuts. Another maker states the exact way to hold his rods for best results depends upon the personal magnetism of the user, while another qualifies his literature with the statement that his equipment "just won't work for everyone."

One treasure racketeer impressed prospective customers with a weird assembly of copper helixes and electrical instruments carried in the back of his car. This super-power detector, he asserted, was able to point directly to precious metals fifty miles away. His racket was fairly safe because he had nothing to sell. He worked on a fee basis, contacting people who believed they had treasure on their land and promising to locate it for a certain sum. He demanded half the fee as a down payment, the balance to be paid when he pointed out the hiding place of the gold, without waiting for it to be dug up. That was the catch.

He learned from a client the approximate locality where the treasure was supposed to be buried, then sent an accomplice to learn from neighbors the position the client believed the treasure was buried. After that he put on his act. Adjusting his instruments every few miles, he would drive an impressive zigzag course that finally led to where the treasure was supposed to be. Then he would order all out of range of his "powerful rays" and with rubber gloves would turn switches to operate his apparatus. Sparks and buzzing noises would emanate from the back of his car. Finally, he would announce the treasure certainly was within fifty feet

(Continued to page 158A)

HUSBAND WISES UP WIFE ON CARS

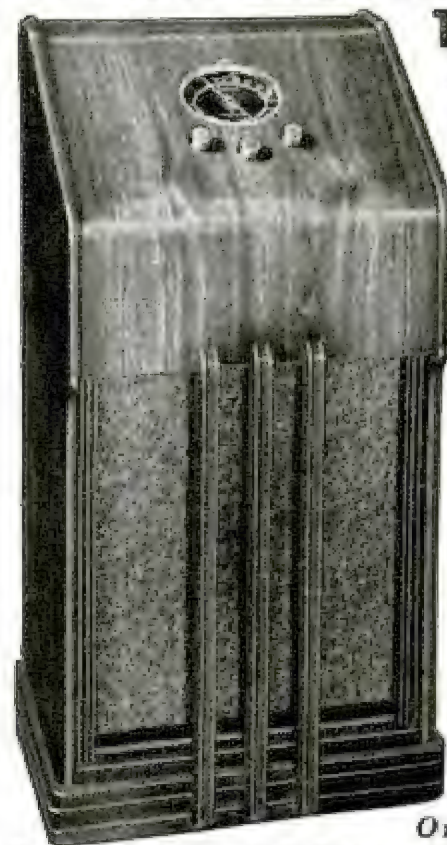


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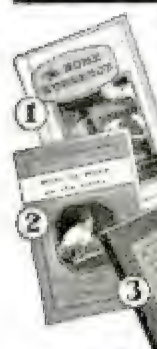
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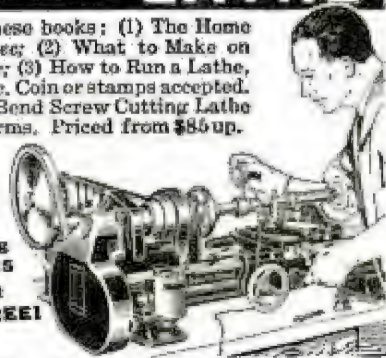
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(Continued from page 156A)

but it was so big its powerful vibrations made it impossible for him to trace it closer. All the client got for his money was a good show.

Most authorities believe many treasure troves are still buried in the United States although they think most of the caches amount to only a few hundred or a few thousand dollars. They are mostly the savings of individuals who buried them for safekeeping. Nearly all the stories of vast treasures amounting to millions of dollars are mere hoaxes, they believe. Another thing they point out is that the average person, in burying treasure, would likely dig only a foot or so into the ground. Some have been buried five or six feet but many that have been found were located only a foot or so below the surface. Nevertheless, disappointed treasure hunters are apt to keep on digging long after they have passed a reasonable depth.

"You can break your neck tumbling into deep holes treasure hunters have dug around old ruins in the southwest and in Mexico," an archaeologist declares. "Common sense should have told the hunters no one needs to burrow so deeply."

In California two treasure hunters, spurred on by the actions of a magic gold detector, dug a twenty-foot shaft, then a sixty-five-foot shaft in a fruitless hunt for pirate gold. It took them several years, working part time, and all they got out of it was the exercise. In another instance, following the quivering of a gold needle, hunters dug a group of shafts twenty-five feet deep and ran cross-tunnels like a regular mine. The gold is still there, if there ever was any. In a third case hunters honeycombed the top of a hill with a maze of galleries. In all these cases there was no real reason to think that treasure had been buried so deeply.

During the last few years electrical instruments working on the inductive principle have been put on the market. Some of these have real merit in indicating the presence of metallic objects or ore close to the surface, but none is able to distinguish between metals. An inductive machine operates by flooding the adjacent earth with high-frequency radio waves thrown off by a loop aerial, with another aerial a few feet away to receive the waves. A

(Continued to page 160A)

Trindl ELECTRIC ARC WELDER



Works Off Any Storage Battery or Ordinary Light Socket

This new electric arc welder is made possible by the invention of a low voltage carbon. Auto batteries may be used without removing from car. Uses about the same current as four headlight bulbs. Broken parts are simply melted together by the white hot electric arc, in just a few seconds. Produces about 7,000 degrees heat.

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INVENTORS Be Sure to See Page 23A

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This Is the Way! To Make MONEY!

That is what hundreds are saying about the Foleys Electrified Lawn Mower Sharpener business. J. LeVert, N. Y., made up to \$104.50 a week clear profit last season. J. W. Anderson, Texas, reports increasing business for each of last 3 years.

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Special Offer: Attachment for grinding axes, hatchets, knives, etc., included **FREE** with Foleys Lawn Mower Sharpener on our Special Offer, brings you business the year around. Best season just ahead. Send postcard today—no salesman will call.

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We also make the **FOLEY Automatic SAWFILER**
Files hand, band, circular saws. Saves eyestrain—does perfect work. Used by over 3000 repair shops.

(Continued from page 158A)

change of resistance in the ground such as would be caused by the presence of metal objects or rich metallic ore helps to conduct the current with less resistance and the change may be detected with sensitive meters or earphones. Portable inductive apparatus is reliable only for shallow depths and merely indicates the presence of buried current-conducting bodies, whether treasure trove, meteorite, or a collection of old tin cans.

Successful treasure hunters have had good results with this type of equipment although not all types of inductive equipment are suitable for amateur use. Some types, for instance, are not compensated for body or ground capacity and may react to streaks of wet soil or moist grass roots. To be worthwhile, such a machine should not react to such conditions even when lowered to within a few inches of the ground. Even the best equipment of this sort is useless on an ocean beach that contains much black magnetic sand. It is likewise incapable of locating metallic objects under a few feet of water. The best way to find submerged outboard motors or underwater treasure chests, the experts declare, is to go down and look for them.

There are also various other ways of conducting underground explorations. These are used in the science of geophysics, are highly technical and require long training. The best any of these methods can do is to indicate the presence of some foreign mass below the surface. The most widely used method is that of electrical resistivity. In this, two or more electrodes connected to a power source are planted some distance apart in the ground. Then, with two prods connected to a sensitive meter, an expert makes an electrical survey of the surface. He plots the lines of current flow between the electrodes. If some conducting mass such as a ledge of rich ore is hidden below the surface, the lines of force are attracted toward it and the expert is able to locate the body. This method is said to be useful for exploring down as far as 1,500 feet.

Another way of using electricity is the self-potential method in which natural currents in the earth, generated by certain minerals in the presence of underground moisture, are measured. Depths down to about 500 feet can be explored this way.

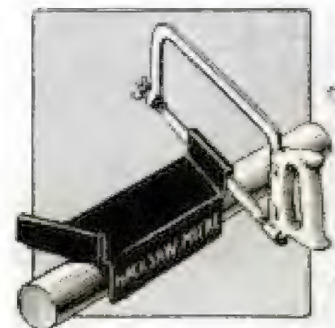
Nonelectrical methods include the use of the torsion balance in determining the gravitational pull of underground masses. This is a highly specialized and difficult field but is a well recognized way of locating salt domes and large bodies of certain heavy ores.

The seismic method, in which artificial earthquakes are generated by explosions close to the surface, is one kind of exploration used in hunting for new oil fields. The elapsed period from the time of the explosion until the wave bounces back from underground strata allows the depth and contours of the strata to be measured. Seismic exploration, however, does not indicate the presence of oil, but merely makes it possible to locate domed formations under which oil might be found.

In the magnetic method, a magnetometer is used for pointing out changes from the normal position of magnetic lines of force. This is valuable in determining the presence and position of bodies of magnetic ore but is worthless in hunting for nonmagnetic kinds. Radioactive materials such as ores containing minute amounts of radium can be detected by means of Geiger tubes. These are tools of the geophysicists. All of them, however, are practical only for studying comparatively large masses and are no good for finding a small chest, even if there were a million dollars inside it.

F1601 Miter Guides Hack-Saw Blade and Guards Its Teeth

Preventing the blade from wiggling and its teeth from breaking, a handy miter is available for hack saws. It enables the saw operator to make square and diagonal cuts.



❑Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information will be furnished by our Bureau of Information upon request, accompanied by stamped envelope.

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Los Angeles, Calif.
Blvd.

Well of the Padres His Living Tomb



San Diego Reporter, Weak from Loss of Blood, Cheats Death in Ancient Shaft

"For nearly two hundred years this death-trap had awaited its human prey...that was the grisly thought uppermost in my mind, as I fought for life in the ancient crumbling mission well of San Diego de Alcalá," writes E. P. Lyle III.

"First, as I was climbing down to explore an opening at the water level, a loose tile struck me on the head; then the rickety ladder slipped, plunged me dazed and bleeding into the water.

"But I had clung to my flashlight and as the cold water cleared my senses, I

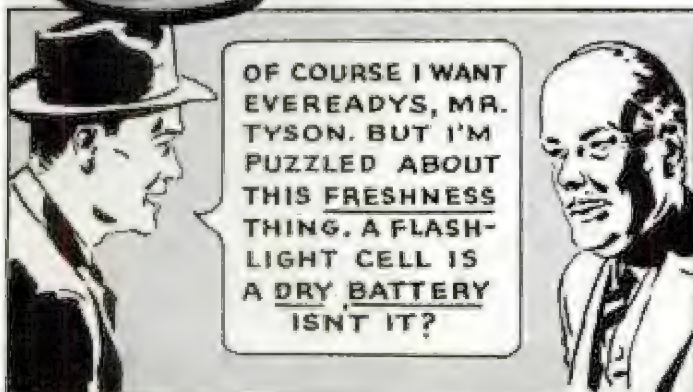
could see it shining under the surface. Paddling to keep afloat, I swung the light as best I could around the well. A rusted old pipe attached to the wall offered a hand hold, and was stout enough to hold me as I fought off growing dizziness from loss of blood, and climbed hand over hand to where my companions could reach me.

"They would have pulled a corpse out of that well if it hadn't been for the DATED Eveready batteries in my flashlight—batteries that were really *fresh* when I bought them months before. I would certainly have lost consciousness and drowned before my friends could have reached the mission (a quarter mile away) and returned with rope and a *fresh* light."

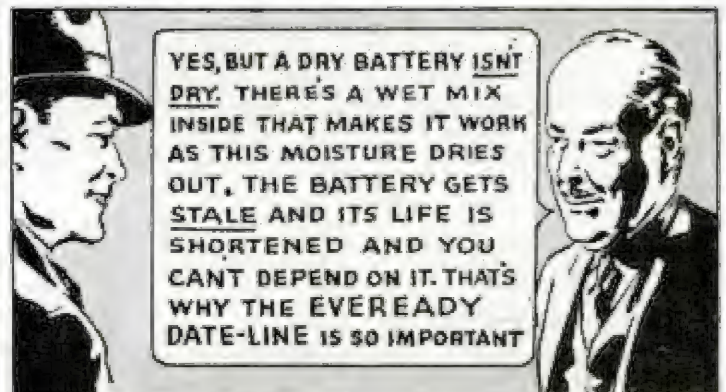


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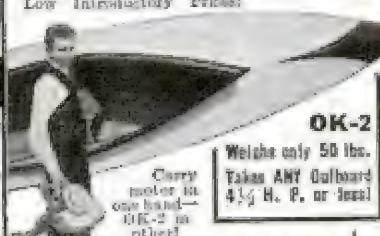
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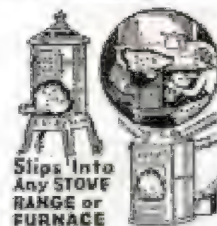
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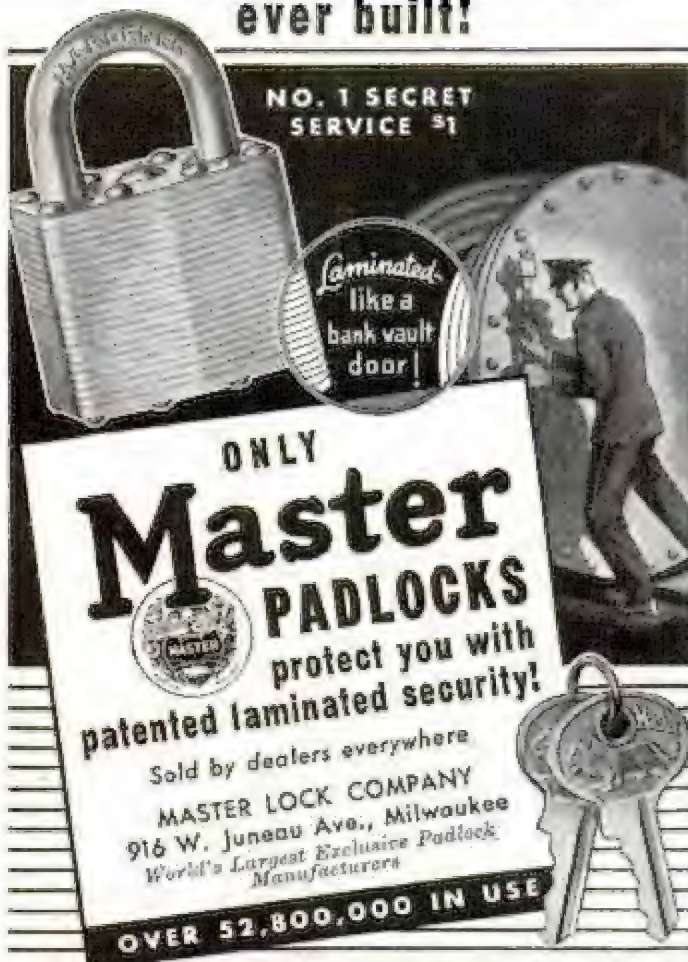
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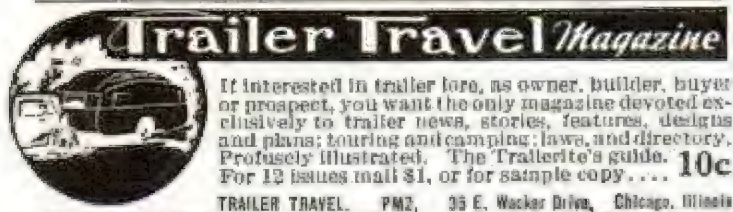


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Wooden Ships and Iron Men

(Continued from page 221)

built for Baines of Liverpool by the Boston "wizard," Donald Mackay. Before these clippers appeared upon the scene, history had been made by British-built ships. The famous "Marco Polo" was the best and fastest of these. She made two round-the-world voyages in eleven months and ten days, setting a pace for this greatest of all ocean racecourses, some 30,000 miles in length, that was never subsequently beaten. In harbor this ship flaunted a large canvas sign, extending from mast to mast, on which was displayed the legend "Fastest Ship in the World," and at her main truck she flew the "Cock in his Triumph." This ship with her record passage of sixty-seven days to Melbourne was the one the Maine clippers had to beat. Their work was cut out for them.

"Lightning" was built in 1854, and Forbes came across the Atlantic to take her over from the builders' yard. Laughlan Mackay sailed in the ship as passenger and builders' representative, and he must have proved a tower of strength to Forbes; when the latter on an occasion remarked to Mackay that it appeared inevitable that the "sticks" would be taken out of the ship by the gale then blowing, Mackay replied, "Don't worry, captain, you couldn't drive the masts out of her if you tried, my brother built the ship."

On this maiden passage the ship broke all records, she crossed, port to port, in 299 hours. In one day she sailed 436 miles, a record for all time, and several times did twenty-one knots. At that date no steamer had ever approached that great day's run within 150 miles.

"James Baines" was a larger "Lightning" by 430 tons and she followed her sister in 1855. On her maiden voyage she crossed to Liverpool in two hours less time than had her sister, so there was little to choose between them. She then went out to Melbourne in sixty-three days, with 702 passengers and 365 sacks of mail. In one day she sailed 423 miles and several times reached twenty-one and one-half knots, and during this phenomenal run every stitch of canvas was set, even to the lightest "gossamer." Such a feat was unique, and proves she was a truly noble vessel.

(Continued to page 166A)

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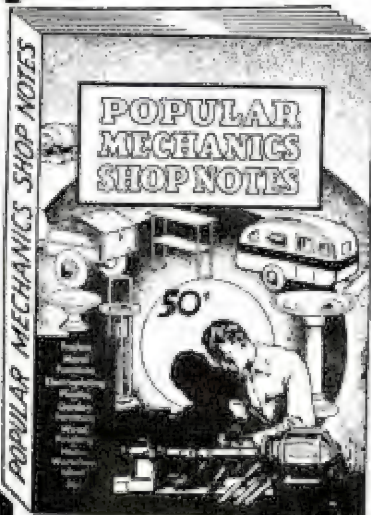
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(Continued from page 164A)

In 1857 the ship was taken for trooping to India. "Lightning" was also taken and she beat all the steam transports not by hours or days but weeks. Later editions of "James Baines" were "Champion of the Sea," "Chariot of Fame," "Donald Mackay," "Pharaoh's Daughter," and "Blue Jacket," all built for, or early sold to, Britain, and all true clipper ships.

The last-named vessel was lost by fire off the Falkland Islands, and two years and nine months afterward her figurehead, a blue-jacketed seaman of pre-Civil War times, was washed on shore at Rottnest Island, West Australia, to stand on the lawn of the Governor's summer residence there for many years, and then be chopped up for firewood by a cheerful vandalistic idiot who knew no better.

The clippers have now gone from the surface of the Seven Seas; they remain but a legend and a name. The stately sea-queens, each with her grace, her glory, paid toll of fire, storm, reef, and leak, to perish on the rocky coasts of Anno Domini and find a last resting-place from their labors in Dead Man's bay. "Sleep after toyle. Porte after stormie seas."



THANKS SO MUCH - YOU'RE JIM GREENE AREN'T YOU? I'VE HEARD MY BROTHER BOB TALK ABOUT YOU LOTS. WHY DON'T YOU EVER COME OVER WITH THE REST OF THE CROWD?

OH - I - ER I COULDN'T - THAT IS YOU SEE - I'M - ER - I'M NO GO AT SOCIAL STUFF

WELL, WELL, MISS CLEOPATRA, DIDN'T GET FAR THAT TIME - DID YOU?

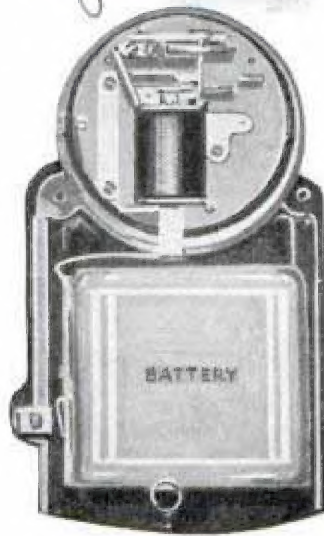
H'MM - BOB, I BET I KNOW WHY HE ACTS STAND-OFFISH. IT'S HIS FACE. ALL THOSE PIMPLES. WHY DON'T YOU TELL HIM ABOUT FLEISCHMANN'S YEAST? YOU KNOW HOW IT HELPED YOU!



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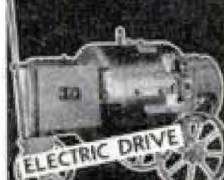
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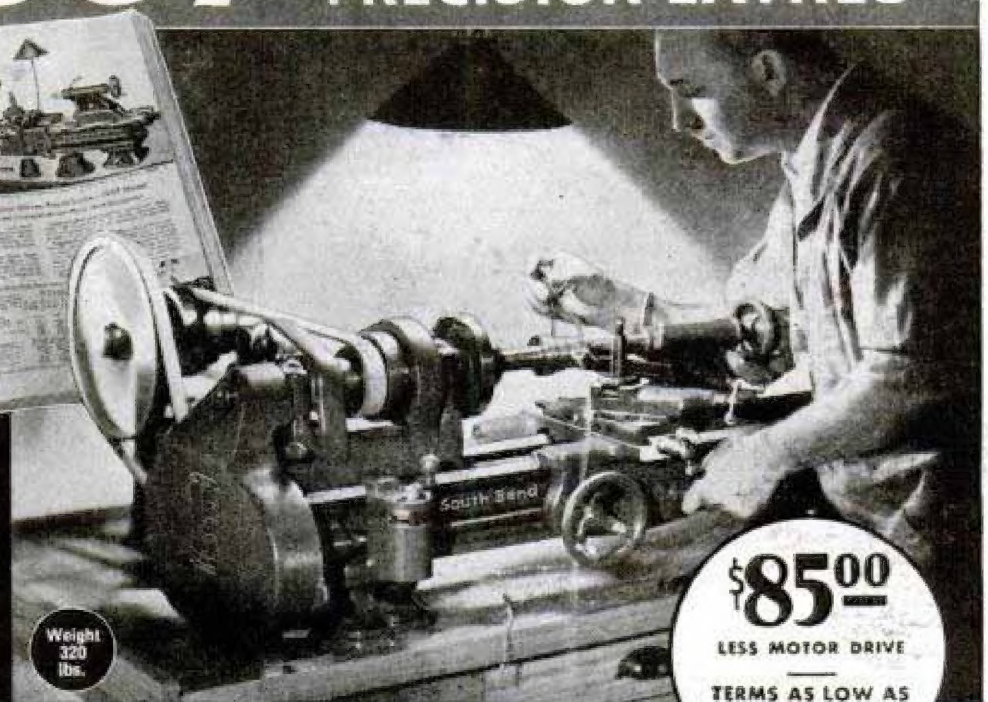
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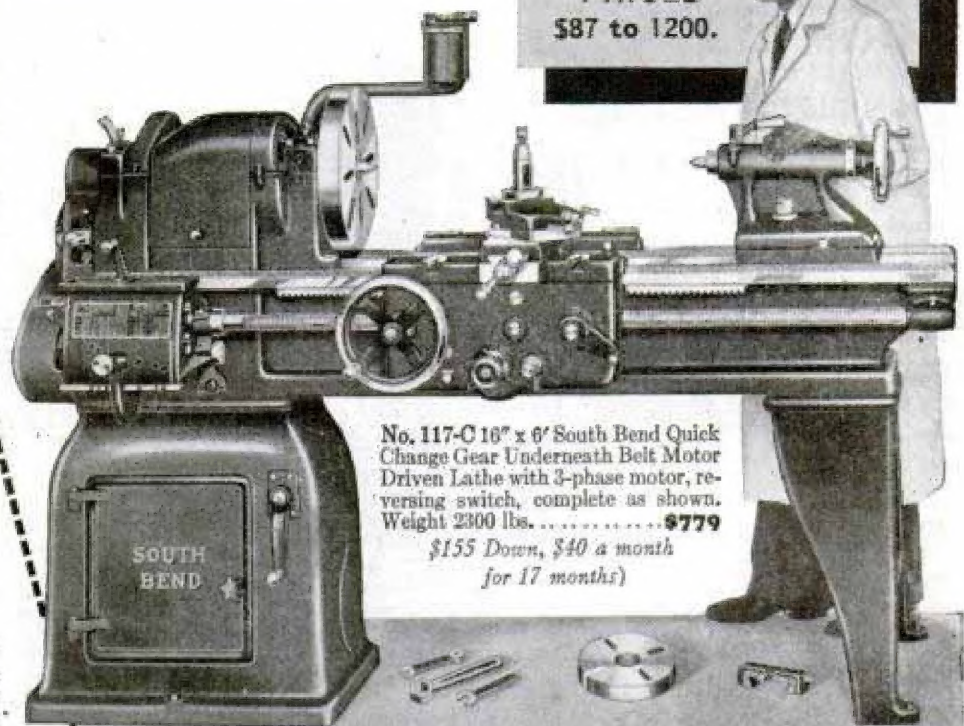
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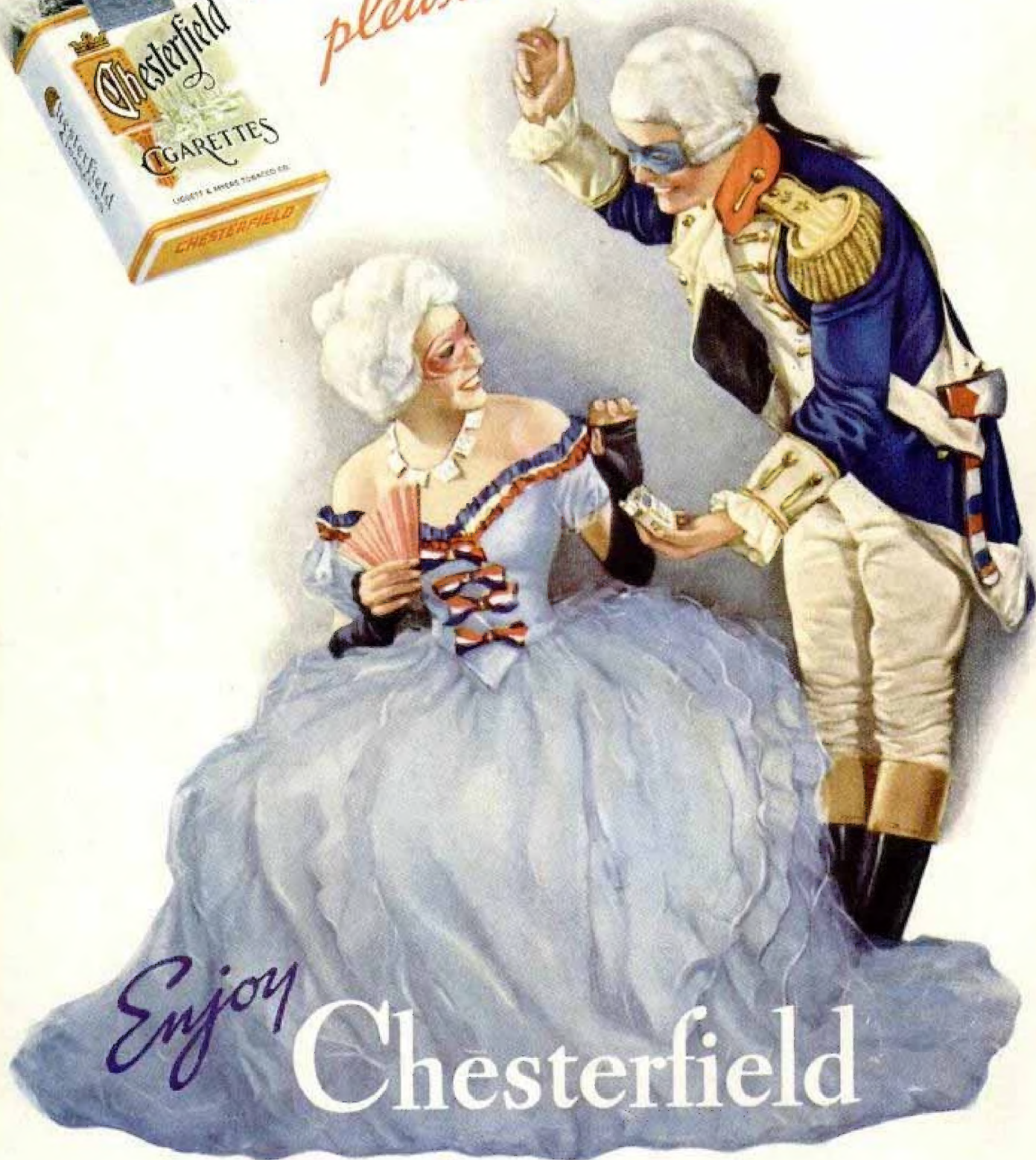
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